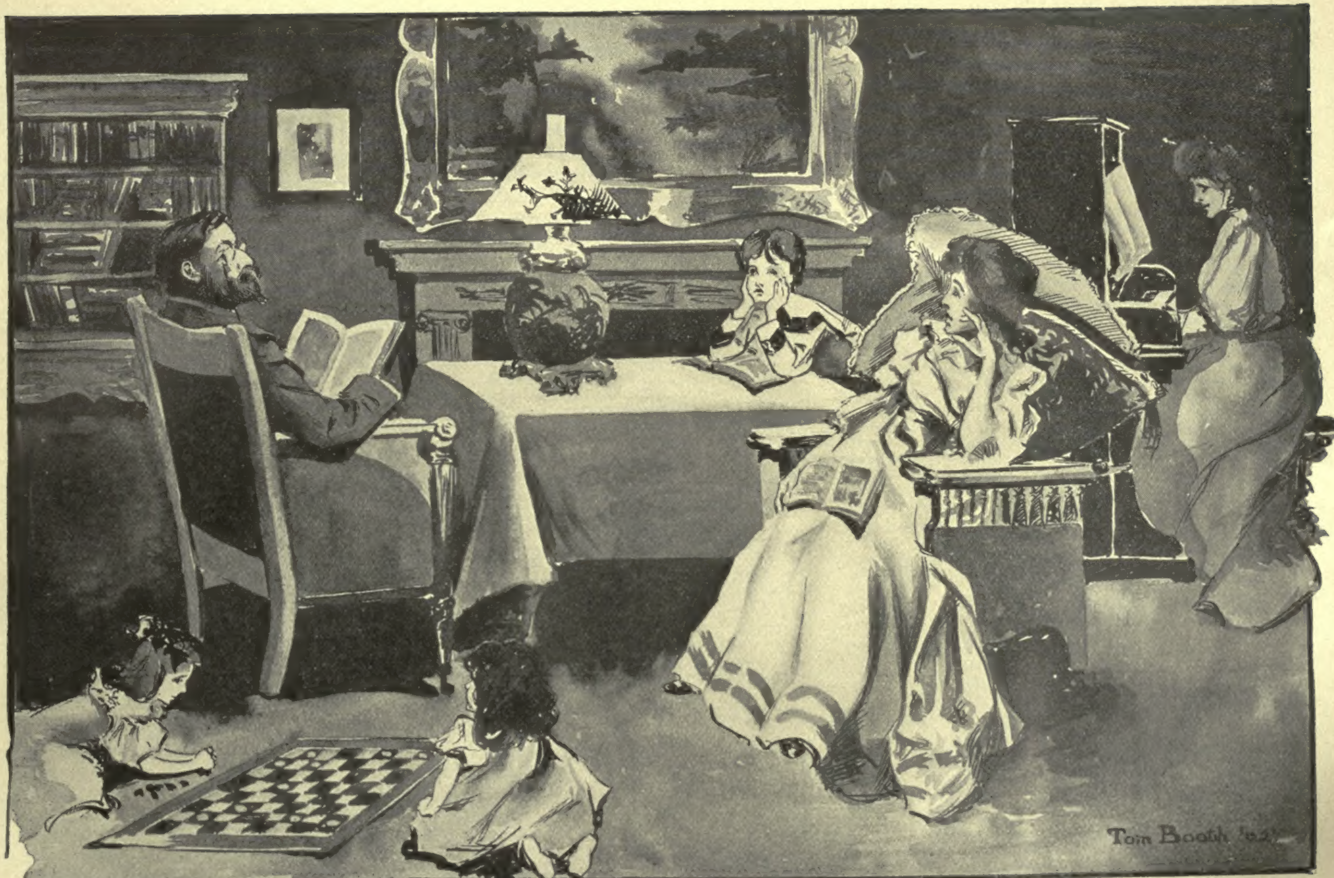
THE HOME CYCLOPEDIA

OF PRACTICAL INFORMATION



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BOOK I

THE HOME CYCLOPEDIA

OF

GENERAL INFORMATION

ALPHABETICALLY ARRANGED, TELLING JUST THE THINGS ABOUT EVERYDAY SUBJECTS IN SCIENCE, ART, MECHANICS AND ABOUT COMMON OBJECTS EVERYONE NEEDS TO KNOW, GIVING DERIVATIONS OF FOREIGN WORDS, ETC. AN INDISPENSABLE HELP FOR YOUNG AND OLD, AND ESPECIALLY FOR THE WRITER OF ESSAYS AND ARTICLES.

A READY REFERENCE ON A THOUSAND SUBJECTS

ENCYCLOPEDIC DICTIONARY

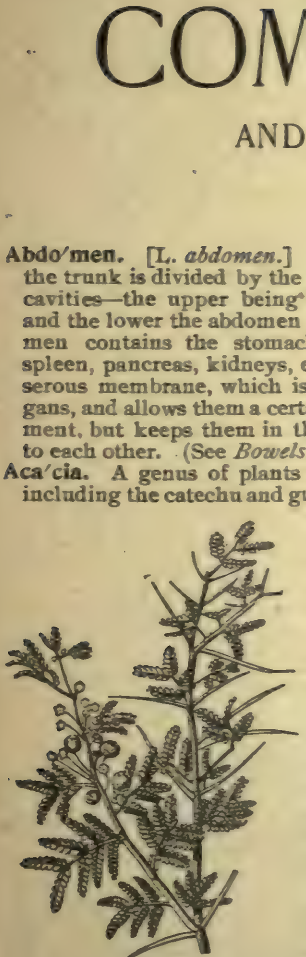
OF

COMMON THINGS

AND OTHER USEFUL INFORMATION

Abdo′men. [L. *abdomen.*] In the human body the trunk is divided by the diaphragm into two cavities—the upper being the thorax or chest, and the lower the abdomen or belly. The abdomen contains the stomach, liver, intestines, spleen, pancreas, kidneys, etc. It is lined by a serous membrane, which is folded over the organs, and allows them a certain freedom of movement, but keeps them in their proper relations to each other. (See *Bowels.*)

Aca′cia. A genus of plants of the Pulse family, including the catechu and gum-arabic trees. The species are numerous, are frequently thorny, and grow mostly in warm countries. Nearly 300 species are Australian or Polynesian and have vertically compressed leaf-stalks, instead of the bipinnate leaves of the much fewer species of Africa, etc. Very few are found in temperate climates, but many are cultivated in greenhouses for the sake of their flowers, which are of great beauty and often fragrant. The North American locust tree and other species of robinia are often called acacia in the United States and Europe, but wrongly.



Accord′ion. A small musical instrument, with keys and bellows, the tones of which are produced by the vibration of metallic springs, occasioned by a current of air rushing from the bellows through valves attached to the keys, and opened by the fingers of the player.

Ace′tic Acid. [L. *acetum,* vinegar; *acidus,* sour.] The most common of the vegetable acids, familiar to all as the sour principle in vinegar. It occurs in the juice of many plants, and in some animal secretions; but on the large scale it is prepared from damaged wines, by the fermentation of malt, or by the destructive distillation of wood. Pure acetic acid is prepared by the dry distillation of wood. The pure acid has a sour taste and a pungent smell, is poisonous, and burns the skin. In the arts it is used as a mordant in calico-printing, and in the preparation of certain varnishes. It is also used as a condiment and in medicine. The salts of acetic acid are called acetates, the most important of them being acetate or sugar of lead.

Acet′ylene. [L. *acetum,* vinegar.] A substance composed of carbon and hydrogen and of remarkable powers. It is not a new discovery but has only lately been produced in large quantities from carbide of calcium, a product of the electric furnace. When water is thrown on this substance it gives off acetylene gas. It was found about 1895, that this gas, when burned in a suitable burner, would give the brightest light of any known gas. When placed under strong pressure acetylene becomes a liquid, and the gas which arises from this is burned in suitable lamps, yielding a light twelve times as bright as that of ordinary coal gas. But this new light has not come into much use, for there is danger of explosion. Acetylene has other uses, for a great many chemical substances can be made from it, belonging to what are called the hydrocarbons.

Achromat′ic. [Gk. *achromatos,* colorless.] Free from color (applied to lenses, telescopes and microscopes); transmitting light without decomposing it into its primary colors.—*Achromatic lens,* a combination of two dissimilar substances, as crown and flint glass, so arranged that the chromatic aberration produced by the one is corrected by the other, and light passes undecomposed.

Ac′id. [L. *acidus*, sour.] A general term used in chemistry to designate a special group of substances, mostly, but not always, oxygen compounds. The chief distinguishing property of acids, and one which is common to all of them, is that of combining with bases to form salts. They are also distinguished by their *sour* or *acid* taste, and by the power of turning blue vegetable colors into red. These blue colors are litmus, syrup of violets or of radishes. When these blues have been changed into green by an alkali, their color is restored by an acid.

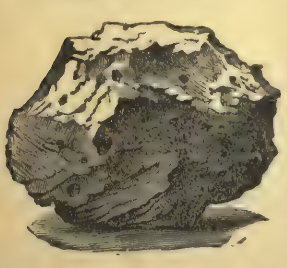
A′corn. [AS. *æcern*, from *æcer*, a field.] The seed or fruit of the oak, growing in a woody cup. Acorns contain starch and oil, and generally have a bitter taste. They are eaten freely by swine, while the fruit of some species are sweet and nutritious and are eaten by man. The oil has been used in cookery and for other purposes.

Ad′der. [AS.] A name often applied to the common viper, as well as to other kinds of venomous reptiles or serpents. In North America the term *adder* is commonly applied to several harmless snakes.

Adult′eration. [L. *adulteratio*, corruption.] The mixing of foreign substances with articles of food and drugs, of water with milk, etc., for the purpose of defrauding customers. This is a very common practice, and often renders drugs useless and food injurious, if not poisonous. Many laws have been passed to check it, but not with full effect.

Aeo′lian Harp. [L. *Æolus*, the god of the wind.] A box of very thin wood, with strings of catgut or other vibratory material stretched across it, and sounding holes cut in the top. When placed in a current of air, as in a window between the raised sash and the sill, it yields a music sweet in tone, but usually sad in character.

A′erolite. [Gk. *aer*, air, and *lithos*, a stone.] A meteoric stone that comes into the atmosphere from space and falls to the earth. It is of the same nature as the shooting stars, small particles, which become so hot from friction with the atmosphere that they are burned up. Aerolites are very hot when they first fall. They are largely made up of pure iron, but contain also nickel, silicon, and other elements. Some very large ones have been found weighing many hundreds of pounds.



Af′terglow. The brilliant twilight colors often seen after sunset. These are of red and yellow tints and sometimes are very lasting. If seen before sunset they are called **foreglows.**

Ag′ate. [L. *achates*; so called from the name of the river Achates in Sicily, where it was first found.] A variety of quartz, found in loose rounded pieces in rocks, or as loose pebbles in beds of rivers or gravel. Wood may be converted into agate by infiltration with waters carrying silica in solution, as in the celebrated petrified forest of Arizona. Agates show various tints in the same specimen, and the colors are delicately arranged in stripes or bands, or blended in clouds. They take a fine polish, and are much used in the manufacture of rings, seals, beads, handles of knives and forks, cups, smelling bottles, and many other ornamental articles. Burnishers for polishing, used by bookbinders, are made of agate.

Aga′ve. The name of a genus of plants growing in tropical America. The principal species is known as the American Aloe, or century plant, under the idea that it blooms but once in a hundred years. This is a mistake, its period of blooming being about ten years. It is called *maguey* by the Mexicans, who distil from its sap an intoxicating drink. The coarse thread called sisal hemp is made from the fibres of its leaves.

A′gue. [L. *acutus*, sharp.] An intermittent fever, consisting of hot and cold stages in succession, with an intermediate period. It comes on at fixed periods, one, two, three, or more days apart. It is now generally known as malarial fever. Long supposed to be due to marsh miasma, it is now traced to a bacterial germ, and there is much reason to believe that the mosquito is the carrier of this germ, which it injects into man with its bite.

Air. [Fr., from Gk. *aer*, air; *aein*, to blow.] The gaseous fluid which we breathe and which surrounds the earth. It is a mixture of oxygen and nitrogen, with a small amount of carbon dioxide, the average proportions being, by volume: oxygen, 20.96 per cent.; nitrogen, 79.00 per cent.; carbon dioxide, 0.04 per cent. (See *Atmosphere; Compressed Air; Liquid Air.*)

Air Bladder or Swim Bladder. A membranous sac found in most fish, which contains a quantity of gas, and is thought to help the fish to rise and sink in the water. It is very small in some fish, quite large in others, and wanting in sharks and some other fish. In some cases it is converted into a sort of lung and is used as a breathing organ.

Air-brake. A brake now used on railroad cars and engines, invented in 1869, by George Westinghouse, of Pittsburg. Air is compressed by the steam of the engine boiler, and carried in tubes to the car wheels, where it exerts its pressure on the brakes when it is desired to stop the train. (See *Brake.*)

Air-gun. A gun which uses compressed air instead of gunpowder to drive out the bullet. There is a piston to force the air into a cavity, and a valve opened by the trigger, which lets the air out against the bullet. This is driven out with some force. Air guns are of little use.

Air-pump. An instrument for the withdrawal of air from a closed vessel, producing an empty space or vacuum; in ordinary air-pumps the vacuum is very far from complete, and in the most perfect of them some air remains. Many interesting experiments may be performed in the exhausted receiver of an air-pump, such as the boiling of water at a much lower than the

usual temperature, and the extinguishing of a candle, a proof that air is necessary to combustion.

Al′abaster. [Gk. *alabastros.*] A fine-grained whitish limestone or marble. It is of two kinds, one of which is a carbonate of lime, the other a sulphate of lime or gypsum, and to the latter the term is now generally applied. It is carved into vases, mantel ornaments, statuettes, etc.

Al′batross. [Span.] A genus of large, web-footed, aquatic birds, allied to the gulls. They are the largest of sea-birds, capable of long-continued flight, and are often seen hundreds of miles from land. They are found chiefly in the southern hemisphere.

Albu′men or **Albu′min.** [L. *albus,* white.] A nutritive substance found in animals; also a supply of nourishing matter within the integuments of the seed in many plants, external to the embryo or germ in some, and within it in others. It is the floury part in wheat and other grains, and is a very important part of food. Albumen exists in many of the solids and fluids of the animal body, also in many plants. It occurs in its purest form in the white of an egg, and in the serous or liquid portion of the blood. It is a yellowish, transparent, gum-like substance, soluble in cold water. One of the most characteristic properties of a solution of albumen is its power of coagulation. If a solution be heated to about 70°, it becomes solid and opaque, and in this state it is insoluble in water, but dissolves in dilute alkalies.

Al′chemy. [Ar. *Alkimia.*] A pretended art arising from chemistry, by which it is sought to make gold or silver out of baser materials, or to produce a universal medicine. The conversion into gold was to be effected by what was called the *philosophers' stone.* Alchemy was practiced for many centuries, but its only important result was the discovery of various chemical elements, such as sulphuric, nitric and muriatic acids.

Al′cohol. [Fr., from Arab.] A volatile organic substance produced during the fermentation of vegetable juices which contain sugar. It is a colorless, limpid liquid, possessing an agreeable smell and burning taste; is very inflammable, and burns with a bluish flame. It is used for thermometers in measuring low temperatures, and can be employed down to −39 F. It is prepared from spirituous liquors by successive distillations. The alcohol being more volatile than water, comes off first; but it cannot be entirely separated from water by this process, since the strongest spirit so obtained contains 10 per cent. of water. To obtain pure alcohol, this water has to be removed by distilling the spirit with some substance capable of combining with water, such as quicklime or potassium carbonate. To the chemist alcohol is very useful as a solvent, and in medicine as a solvent and antiseptic agent. It is the alcohol in spirits, wines, and malt liquors to which the intoxicating effects of these beverages are due. In chemistry the term alcohols is applied to a considerable number of liquids which resemble ordinary alcohol in certain chemical reactions, and include methyl, propyl, and various other compounds.

Al′der. [AS. *alr* or *aler*, L. *alnus.*] A genus of plants, consisting of trees and shrubs, growing chiefly in moist soils. The wood is used by turners, and is very valuable for mill-wheels and other wood-work under water. It affords the best kinds of charcoal for making gunpowder, and its bark is used by dyers and tanners.

Ale. [AS.] A liquor made from an infusion of pale malted barley by fermentation with a bitter, usually hops. (See *Beer.*)

Al′gebra. [Arab. *al-jebr*, reduction of parts to a whole.] A sort of universal arithmetic, in which the unknown terms are expressed by letters of the alphabet, and dealt with as if known. By this means very intricate problems can be solved, which would be impossible with ordinary figures. In the higher mathematics algebra is of extreme importance.

Aliz′arine. [Fr. *alizarine.*] A peculiar coloring principle obtained from madder, and now produced artificially from the coal-tar product anthracene. It is the coloring matter used in the dyeing of Turkey red.

Al′kali. [Arab.] The name applied in chemistry to a class of bodies possessing the following common properties:—(1) They have the power of turning vegetable blue colors green, and vegetable yellows brown; (2) they restore the color to a blue solution which has been reddened by an acid; (3) they have a strong affinity for acids, combining with them to form salts which possess neither acid nor alkaline properties—hence an acid and an alkali are said to neutralize one another; (4) they are all soluble in water. The alkalies proper are four in number—potash, soda, lithia and ammonia. They exert a powerfully corrosive action on animal and vegetable substances. As bicarbonates they are often used along with carbonic acid to correct acidity of the stomach.

Al′ligator. [Span. *el legarto*, the lizard.] A large American reptile of the Crocodile family. It has a shorter and broader snout than the crocodile, and the large teeth of the lower jaw fit into pits

in the edge of the upper jaw, which has no notches. Alligators vary in length from 2 to 20 feet, the head being about one-seventh of the entire length. They embrace three genera, the alligator, abundant in Florida, and the caiman and jacare, found in tropical South America. The caiman is also found in Mexico. Their principal food is fish, but they catch and devour land animals, as the sheep and pig, and sometimes even men. An alligator lays from 50 to 60 large eggs in a hollow in the mud, covered over with grass and reeds, and leaves them to be hatched by the sun. The young take to the water as soon as hatched, being carefully tended by the mother alligator. The skin when tanned makes good leather for boots and shoes.

Alloys′. [Fr. *a loi*, from L. *ad legem*, according to rule.] The name given to the mixtures which result from fusing different metals with each other. Both gold and silver when pure are too soft for the manufacture of plate, coin, or jewelry; but when mixed with a small percentage of copper, they are rendered harder and more durable, without suffering any loss in color. One of the most useful alloys in the arts is brass. It consists of zinc and copper, and the proportion of each metal in the compound is regulated to suit the quality of the brass required. Among the important alloys of copper and tin are (1) bronze, containing 90 parts of copper and 10 of tin; (2) bell-metal, containing 80 parts of copper and 20 of tin; (3) speculum-metal, containing 67 parts of copper and 33 of tin. Type-metal varies somewhat in its composition; one variety consists of 80 parts of lead and 20 of antimony. Aluminium-bronze and nickel-steel are important recent alloys. The alloys of other metals with mercury are termed *amalgams*, and the process of amalgamation has long been employed in separating fine gold from other materials.

All′spice. From a tree of the Myrtle tribe, a native of the West Indies, allspice, or Jamaica pepper, is obtained. Allspice is the dried berry; it is so called because it is considered to have the flavor of cloves, cinnamon, and nutmeg combined. It is mildly pungent and agreeably aromatic.

Al′manac. A book or pamphlet telling the divisions of the year into months, weeks, and days, the times of rising and setting of the sun and moon, movements of the tides, eclipses, and other information about the earth and the stars. Almanacs formerly pretended to foretell the weather, but only ignorant persons beleived this. Almanacs are now published giving many facts of official and other kinds. "Poor Richard's Almanack," published by Benjamin Franklin in 1732, is a well-known and interesting almanac. It was published for 25 years and was filled with wise and pithy sayings, inculcating industry and frugality as helps to virtue.

Al′mond. [Fr., from Gk. *amygdalon*.] The fruit of the almond tree, a native of the East and of Africa, grown in the countries around the Mediterranean, and of late years produced in large quantities in California. The fruit or nut is covered with a hard green shell, which dries as it ripens, and finally bursts open and lets the almond drop out. The principal varieties in cultivation are the sweet, bitter, thin-shelled, thick-shelled, and Jordan almonds. Sweet almonds are used in confectionery and for dessert. They contain a large quantity of a bland fixed oil, are of a very agreeable taste, and very nutritious. Bitter almonds contain a substance called amygdalin, from which a peculiar volatile oil is obtained. The Jordan almonds, brought from Malaga, are the finest. Almond wood is a very hard, dense wood, something like lignum vitæ. It is used for the teeth and bearings of wooden cog-wheels.

Al′oe. [L. *aloe*.] A genus of succulent trees and shrubs of many species, but the greater number having the habit and appearance of evergreen herbaceous plants. They are natives of warm climates, and flower only once, after a growth of from fifty to one hundred years. The fibres of the leaves are manufactured into thread, cords, and nets, and stockings are woven from the fibres of a species found in Jamaica. But aloes are chiefly valuable for their medicinal properties, the drug called aloes being obtained from the juice of several species.

Alpac′a. An animal of Peru, having long, fine, woolly hair; a species of llama (*q. v.*). The thin cloth called alpaca is woven out of alpaca wool, mixed with silk or cotton.

Al′phabet. [Gk. *Alpha* and *Beta*, the first two letters of the Greek alphabet.] The name given to the series of letters of which the words of any language are made up. Alphabets are very ancient, and every civilized nation has one of its own. In the Hebrew there are letters for the consonants only. Some alphabets have a letter for each syllable, and the Chinese have a character for every word. The English alphabet has twenty-six letters. Some have fewer and some more, the Russian having thirty-six.

Al′um. [L. *alumen*.] A white saline compound used in dyeing and many other industrial processes. Chemically it is known as a double sulphate of potassium and aluminium. It has an astringent and sweetish taste, turns vegetable blue colors red, dissolves in water and melts when heated. When more strongly heated it loses its water of crystallization, leaving the white substance known as burnt alum, which is used as a caustic. It has many highly important uses in the arts, as a mordant in dyeing, etc., and in medicine it is of great use as an astringent in stopping bleeding. Wood and paper which have been dipped in a solution of alum are less liable to catch fire.

Alumin′ium. [L. *alumen*.] A white metal, somewhat like silver in appearance. It occurs chemically combined in all the older rocks and in clay. It is very malleable, and therefore capable of being hammered into thin sheets or drawn into fine wire. Being highly sonorous, it is a suitable substance for bells. It is very light, being only 2½ times heavier than water, and therefore 4 times lighter than silver. It melts

when heated to redness, and has no action on water at ordinary temperatures. On account of its bright lustre, hardness, and malleability, it is largely used for jewelry, for balance beams, and in making sextants and other astronomical instruments, and on account of its lightness for many other purposes. It forms alloys with most of the metals. It was first discovered in 1828, and was not produced in commercial quantities until 1855. It is now cheaply produced by electricity.

Amal′gam. [Fr., from Gk. *malagma*, a plaster.] An alloy of mercury with another metal or metals. Amalgams are largely made use of in the arts. Metals are sometimes gilded by washing them with an amalgam of gold and mercury; the mercury is then driven off by heat, leaving the gold on the metal.

Am′ber. [Arab]. A hard, yellow, translucent resin, found as a fossil in beds of lignite, in alluvial soils, and on sea-coasts, especially the Prussian coast of the Baltic. It takes a fine polish, and is much used for making ornaments, such as necklaces, earrings, pendants, and beads; for the mouth-pieces of pipes and cigar-holders, and for burning for perfume. It is also used as a basis for a fine varnish. By friction it becomes strongly electric.

Am′bergris. [Fr. *ambre gris*, gray amber.] A substance found floating in the sea or thrown upon the coasts in warm climates, and also in the intestines of the sperm whale, which is believed to be in all cases its true origin. The floating masses are sometimes from 60 to 250 lbs. in weight. In color it is gray, yellow, white, or black, and often variegated like marble. It is much used in perfumery, and to improve the flavor of wines and cordials. In Asia and Africa it is used as a medicine, also as a condiment in cooking.

Am′ethyst. [L. *amethystus*, from Gk. *amethystos*, without drunkenness, because the ancients believed that liquor drunk out of cups made of amethyst would not intoxicate.] A variety of rock-crystal or quartz, of a purple or bluish-violet color, much used as a precious stone for rings, seals and other ornaments.

Ammo′nia. [Gk. *Ammon*, a name of Jupiter.] A chemical compound of hydrogen and nitrogen, containing three atoms of the former to one of the latter. It is an alkaline substance; but as it differs from the other alkalies (see *Alkali*) in being gaseous, it is often called the *volatile alkali*. The gas is colorless, and has a very strong and pungent smell, by which it is easily recognized. It is found in minute quantities in the air, being evolved during the putrefaction of animal and vegetable substances. Traces of it are also found in rain-water and in the breath. Water absorbs it readily, hence ammonia is said to be very soluble in water. The solution is known to chemists as *liquor ammoniæ*, and in shops it is sometimes sold under the name of *hartshorn*. Liquor ammoniæ is sometimes used in medicine; it has a stimulating action on the breathing, and is useful in alleviating spasms, and to some extent in counteracting the effects arising from the bites of snakes and poisonous insects. By the evaporation of liquid ammonia great cold is produced, and this fact is utilized in the manufacture of ice in ice-machines.

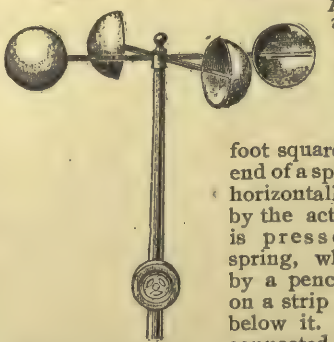
Am′ulet. [L. *amuletum*.] An ornament or any object which is worn as a safeguard against enchantment, disease, or ill fortune. It is generally inscribed with mystical characters. Amulets were greatly used in the past, and are still in use among undeveloped peoples.

Anat′omy, Comparative. [Gk. *anatome*, dissection.] The study of the structure of animals, and comparison of their various organs with one another and with those of man. It is by this study that animals are separated into families, genera, species, and other divisions. Human anatomy is confined to the study of the bony skeleton, muscles, nerves, and other organs of man.

Anæsthetic. [Gk. *an*, in-; *aisthesis*, sensibility.] A chemical substance capable of producing insensibility, much used to prevent pain in surgical operations. Nitrous oxide was first used in tooth drawing in 1844. Ether was used for the same purpose in 1846, and chloroform and other substances later. Now no important surgical operation is performed without an anæsthetic. Local anæsthesia can be produced by cocaine, by freezing the surface with a spray of ether or chloride of ethel, and in other ways.

Ancho′vy. [Span. *anchova*.] A small fish of the Herring family, but not more than three inches long, caught in vast numbers in the Mediterranean, and pickled for exportation. The fishermen go out during the night, carrying torches in their boats. The fish see the light, and swim up to the boats in great numbers, when they are scooped up with nets.

Anemom′eter. [Gk. *anemos*, wind; and *metron*, a measure.] A wind-measurer, to show both the *pressure* and the *velocity* of the wind. A pressure anemometer measures the force of the wind on a plate one foot square attached to one end of a spiral spring placed horizontally. The plate, by the action of the wind, is pressed against the spring, which yields, and by a pencil traces a curve on a strip of paper placed below it. Another pencil connected with the vane records the changes in the direction of the wind. The velocity of the wind is indicated by the revolution of wheels, the number of whose turns is recorded automatically.



Anem′one. [Gk. *anemos*, the wind.] So named because the flower was thought to open only when the wind blows. A genus of plants belonging to the Buttercup family. There are several

species, one of which has a flower, white internally, more or less purple externally. Sea Anemone is the name given to certain ocean animals, of the Polyp family, which bear some resemblance to flowers.

An′eroid. (See *Barometer*.) [Gk. *a*, not; *neros*, wet; and *eidos*, form.] A barometer whose action depends on the varying pressure of the atmosphere upon the elastic top of a metallic box from which the air has been exhausted. By a system of levers connected with the box, and an internal spring, motion is given to an index, which registers the variation of atmospheric pressure.

An′iline. [Ar. *annil*, for *alnil*, the indigo plant.] Aniline was first prepared from indigo in 1826, and takes its name from *anil*, the Portuguese word for indigo. It is now derived from the distillation of coal-tar. It is a colorless liquid, possessing a peculiar smell, and slightly heavier than water, and boils at a temperature of 360°F. The aniline of commerce was first obtained in 1858 by a Mr. Perkin, in the preparation of a dye-stuff derived from aniline. This was known as mauve or Perkin's blue. Every shade and tint of color are produced by the aniline dyes, which are used not only in dyeing, but in preparing colored inks, in manufacturing colored papers, in printing wall-paper, and in coloring soaps, perfumes and cosmetics.

An′imal. [L. *animal*, a living being; *anima*, breath.] A living being with an organized material body, and endowed with the powers of sensation and voluntary motion. All animals are classed together in one great body called the Animal Kingdom, which is separated into a number of sub-kingdoms or grand divisions, of which the highest is the vertebrata, or animals with an internal skeleton.

Ant. [Contracted from the Saxon word *emmet*.] An insect of the family *Formicidæ*, which embraces between two and three thousand different forms, widely distributed in temperate and tropical countries. Ants usually live together in swarms, sometimes many thousands in number, and are distinguished from insects generally by their extraordinary intelligence. Among them, as among bees, there are workers, besides the males and females. The females are the largest, the males next in size, and the workers the smallest and without wings. Ants are very active and strong for their size, and among the most industrious of all animals. Their dwellings usually consist of hillocks of earth, most wonderfully constructed, and containing many little rooms, in which they store their provisions, and nurture their young. The food of ants consists chiefly either of animal matter, or of sweet vegetable substances, such as honey, sugar, and fruit. There are many species of ants, differing considerably in their habits—as the agricultural, carpenter, foraging, honey, amazon, etc. They have many remarkable habits, fighting battles in which large armies take part, keeping and milking the aphis, or ant-cow, cultivating certain grasses with palatable seeds by the destruction of other species, and displaying other evidences of high intelligence. The insects known as termites, or white ants, are not properly ants, but belong to a different class of insects, yet resemble the ants in intelligence. They live in hot countries, and sometimes gnaw out all the inside of the beams of houses, leaving only a thin casing. In Africa white ants live together in vast colonies, some living in houses which they dig underground, some burrowing in wood, while others build up large mounds, ten or twelve feet high, with smaller mounds around them.

An′telope. [Gk. *anthein*, to flower or shine; and *ops*, the eye.] A genus of ruminating animals, intermediate between the deer and the goat. Their horns are hollow and permanent, not annually renewed; those of the deer are solid, and shed every year. Their horns are also round and curved, with rings running round them, and are always black. There are many species in Africa, about fifteen in Asia, two, the chamois and the saiga, in Europe, and two, the pronghorn and the Rocky Mountain goat, in North America. In Africa, particularly in South Africa, antelopes are very abundant, some of the species congregating in immense herds. Their sizes vary from the Guavy, or Pigmy Antelope of Africa, only eight or nine inches high, to forms which are five or six feet high. Most of them yield palatable food, and they are much hunted.

Anten′næ. [L. *antenna*, sail-yard.] Slender articulated organs on the head of insects and crustacea. There are two in the former, and usually four in the latter. They are used as organs of touch, and in insects are called *horns* or *feelers*.

An′thrax. [Gk. coal.] This was the name formerly given to the painful swelling or eruption now called carbuncle. It is now used for a disease often fatal to sheep and cattle, and occasionally attacking man. It is also destructive to horses and camels and many of the smaller animals. When acute, the animal falls and goes into convulsions, and soon dies. The disease has been known by many names. In man it is called Malignant Pustule, Wool-sorters' Disease, etc. It is believed to be due to a minute germ, named *bacillus anthracis*, which enters the system and multiplies in the blood with great rapidity.

An′thracite. [Gk. *anthrax*, coal.] A species of hard mineral coal or carbon, of a metallic lustre, containing little or no bitumen. It is difficult to ignite, but burns with intense heat, and nearly without smell, smoke, or flame. It is principally found in Eastern Pennsylvania, and is said also to be abundant in China.

Anthropol′ogy. [Gk. *anthropos*, man; *logos*, a discourse.] The science of man. It includes the study of man as an animal and as a thinking being, and ethnology, or the study of race divisions. It includes, in short, all that can be learned about man in any direction.

An′timony. [L. *antimonium*.] A metal of a bright bluish-white color and crystalline structure. When strongly heated it burns with a white flame, giving off the fumes of "flowers of antimony," a compound with oxygen. It is a bad conductor of heat and electricity. It does not rust or tarnish when exposed to the air at ordinary temperatures. This property, combined with its hardness, renders it of great service in the arts in the formation of alloys. Pewter, type metal, Britannia metal, are all alloys of antimony. The metal is generally prepared from the mineral stibnite, a compound of antimony and sulphur. This ore is found in France, Spain, Italy, Canada, Borneo, and Australia. It has been long used in Eastern countries for darkening the eyebrows. *Tartar-emetic* contains antimony, tartaric acid and potash.

Antisep′tics. [Gk. *anti*, against, *septikos*, putrefying.] Substances which act to prevent decay or putrefaction of organic materials. Among the many antiseptics may be named sugar, alcohol, carbolic acid, charcoal, nitre, alum, and chloride of zinc. They are used for the preservation of food substances. Cold has a powerful antiseptic action, and cold storage is

ANVIL AND HAMMER

one of the best and cheapest of food preservers. Antiseptic surgery or Listerism is a mode of treating surgical wounds, introduced by Sir Joseph Lister. In this the wound and the instruments are treated with carbolic acid or other antiseptics to prevent dangerous germs from entering. This has proved wonderfully successful, and has enabled surgeons to perform operations successfully which would have led to certain death under the old system of treatment.

Anvil. [AS. *on*; and *fyllan*, to strike.] An iron block, usually with a steel face and a pointed end, upon which metals are hammered and shaped. Anvils are of various sizes, from the small steel ones used by goldsmiths to the immense cast-iron ones used under steam-hammers.

Ape. [AS. *apa*.] A term generally applied to the monkeys, though by some the Anthropoids, or highest forms, are not included in the apes. Others consider these the only apes. They usually dwell in trees, where their power of grasping with both hands and hand-like feet enables them to grasp the limbs with great ease, and to jump from branch to branch without danger of falling. They closely approach the human species in anatomical structure, and the higher forms, the gorilla, chimpanzee, and orang-outang, are often called anthropoids, or man-like apes.

A′phis. The plant louse; a kind of insect which is parasitic upon plants, injuring them by sucking their juices. They are extremely prolific and very injurious. They exude a sweet, viscid fluid known as honeydew of which ants and bees are very fond, and ants often take care of and seem to milk the aphides. These are therefore known as ant cows.

Appendici′tis. [L. *appendix*.] This is a name given of late years to inflammation of the vermiform appendix, a small, finger-shaped tube, depending from the large intestine. Many deaths in the past whose cause was unknown, may have been due to it. If severe, it is now often healed surgically, the abdomen being opened and the inflamed appendix removed, or otherwise treated.

Ap′ple, [AS.] One of the most widely diffused of fruit-trees, growing best in the colder parts of the temperate zone; also its fruit. The tree attains a moderate height, with spreading branches bearing beautiful flowers that have a delicate fragrance. The fruit is roundish in shape, with a depression at each end. The original of the cultivated apple is the wild apple or crab-tree, found in most of the countries of Europe. Though there were no apples in America when it was first settled, trees were introduced, and some of the finest apples, such as greenings, baldwins, Newtown pippins, etc., are now grown, and sent in large quantities to Europe, China and India. The number of varieties of the apple produced by cultivation is very large, and it is perhaps the most useful to man of all the fruits. The wood of the apple-tree is hard, close-grained, and often richly colored, and is used by turners and cabinet-makers.

A′pricot. [Fr. *abricot*, from L. *præcox*, early ripe.] A stone fruit, belonging to the same genus as the plum, but resembling a peach, being of an orange color, oval shape and delicious taste. The tree grows wild in Armenia and the countries eastward to China and Japan, and by cultivation it has been introduced throughout the temperate zone. It was brought into Europe in the time of Alexander the Great, and into England about the middle of the 16th century. The dried apricots of Italy are sent to foreign countries, those of Bokhara and

other parts of the East to Russia, while the preserved apricots of Damascus are famous. Many apricots are now raised in California.

Aqua′rium. [L. *aqua*, water.] An artificial pond, or a globe or tank (usually with glass sides), for containing and showing aquatic animals and plants and their modes of living. Small aquariums are now often kept in houses for study and amusement.

A′queduct. [L. *Aqua*, water, and *ductus*, passage.] An artificial channel to convey water for city supply and other purposes. The Romans had great stone aqueducts, in some places raised on high arches, in others cut through the hills. Some of these are still in use. Some of the largest of modern aqueducts are the Croton Aqueduct, which conveys water to New York City, and the Cochituate Aqueduct, of Boston, which is fifteen miles long.

Arch. [L. *arcus*. Fr. *arche*.] A self-sustaining structure, usually of a curved form, made up of separate wedge-shaped solids, with the joints between them disposed in the direction of the radii of the curve, used to support the wall or other weight above an opening. The beginning of the arch is called the spring, the two bottom stones being the springers, the middle the crown or keystone, and the parts between the crown and the spring the haunches. A flat arch is constructed of stones cut into wedges or other shapes, so as to support each other without rising into a curve.

Archæol′ogy. [Gk. *archaios*, ancient.] The study of the ancient relics of human art. These are very numerous, and are found in all parts of the earth, advancing from the rough tools and weapons of the stone-age to the splendid examples of the five arts found in the mines of ancient Greece.

Ar′chery. [L. *arcus*, bow.] The art of shooting with a bow and arrow. This was in very common use before the invention of firearms, and archery is still practiced as an amusement. The bow is usually made of yew or ash, and the arrows of ash. A good archer can send an arrow from 200 to 250 yards. In the Middle Ages the fate of battles was often decided by the skill of the archers.

Ar′gon. A gas existing in the atmosphere, first discovered in 1895 by Lord Ragleigh and William Ramsay. It is heavier than nitrogen and occurs in a very minute quantity. The discoverers were rewarded by the Smithsonian Institution with a prize of $10,000, offered for the most important new fact concerning the atmosphere.

Armor. A protection worn in ancient time consisting of helmet, body armor, and limb armor, though varying at different periods in the amount of the body covered. The shield served as a moveable piece of armor. Since the invention of gunpowder armor has been of little use and hence has been discarded.

Armor-plate. The larger and more powerful warships are in these times covered with a strong armor made of thick plates of steel, in some cases from 16 to more than 20 inches thick. The steel is often alloyed with nickel to make it harder, and its surface is specially hardened, so as to enable it to resist the blows of the great shot from modern rifled cannon. The armor-plate is carried below the water-line, and covers the gun turrets, while thinner plate is laid on the decks. Not only battle-ships, but forts, are now made strong by armor-plate, which shields the men, and behind which the guns are drawn down after firing.

Ar′rowroot. A kind of starch used as food, obtained principally from the root of a West India plant now cultivated in many warm countries, and from some other plants. It is said that the Indians used the root to cure the wounds made by poisoned arrows, hence the name.

Ar′senic. [Gk. *arsen*, a male (on account of its strength).] A metallic element, seldom found free in nature, but frequently found in combination with other elements, such as sulphur, iron, cobalt, and nickel. The metal is generally prepared from arsenious oxide, or *white arsenic*, one of its compounds with oxygen. It has a bright-gray lustre; it tarnishes in the air by oxidation; its weight is about five and a half times greater than water; when heated to dull redness it rises into vapor without first fusing, and its vapor emits a strong odor of garlic. Metallic arsenic is not of great importance in the arts. An alloy of copper and arsenic produces a brilliant gray metal used in the manufacture of buttons. A compound of arsenic and copper forms a bright substance largely used as a pigment under the name of *Scheele's green*. It was formerly much employed by paper-stainers in the manufacture of wall paper. Sheep-dipping

mixtures consist of a compound of arsenic and soda dissolved in a large quantity of water, together with soap and sulphur. Arsenic has long been used as a medicine, and is used in some countries with the belief that it improves the complexion, but it is a dangerous poison, being fatal to adults in doses of from 2 to 3 grains. No effective antidote to it is known.

Art. An art is something performed by man through the instigation of the mind. In use the word is divided into the Common and the Fine Arts. A common art is something done for the benefit of man, such as the arts of manufacture. A fine art is something done for the enjoyment of man, as the art of painting.

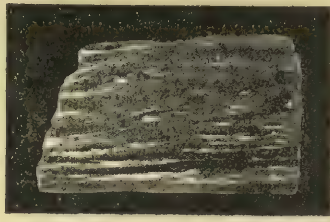
Ar'tery. [Gk. *arteria*, the windpipe; a blood-vessel.] One of the vessels or tubes which carry arterial blood from the heart throughout the body, and venous blood from the heart to the lungs. They have thicker and more muscular walls than veins, and are connected with them by capillaries. In man and other mammals the arteries which contain arterialized blood receive it from the left ventricle of the heart through the aorta. The pulmonary artery conveys the venous blood from the right ventricle to the lungs, whence the arterialized blood is returned through the pulmonary veins.

Ar'tesian Wells. In nature it often happens that a layer of water collects between two strata, such as clay, through which water cannot penetrate. If the ground from which the water has been gathered is high, the pressure at the bottom of the layer will sometimes be very great; and on boring through the retaining bed, the pressure of the water will be sufficient to force it up the shaft to the surface of the ground, and in some cases to cause it to spring into the air from the mouth of the well. This is in accordance with the hydrostatic law that water rises to its own level. In Europe, this method of boring was first practiced in the ancient French province of Artois (hence the name Artesian); but it is now extensively applied in all parts of Europe, in America, and in other parts of the world. The artesian well at Grenelle, near Paris, is 1,798 feet deep; another at Passy, near Paris, is 1,923 feet deep. In America the borings reach a depth of from 2,000 to 3,000 feet. The water from these deep wells being always warmer than surface water, maintains a constant temperature in hospitals and manufactories, warms greenhouses, and reduces variations of cold in fish-ponds.

Ar'tichoke. [Ital.] A plant like the thistle, but having large, scaly heads like the cone of the pine tree. It is cultivated in the south of Europe, and is much esteemed as an article of food. The unripe flower-heads are boiled, and the fleshy lower part of the scales or leaves eaten, dipped in olive oil or butter, with a little salt and pepper.

Artil'lery. [Fr., from Low L., *artillare*, to make machines.] Weapons of war; large ordnance, including guns, howitzers, mortars, rockets, and engines of war of all kinds, with their carriages, ammunition, and apparatus. Also the men and officers of that branch of the army to which the care and management of artillery are confided.

Asbes'tos. [Gk. *asbestos*, that cannot be quenched.] A mineral substance, unaffected by fire, occurring in long and delicate fibres, or in fibrous masses or seams, usually of a white, gray, or green-gray color. The finer varieties have been wrought into gloves and cloth which are incombustible. The cloth has been recommended for firemen's clothes. Asbestos is also employed in the manufacture of iron safes, fireproof roofing, and lamp-wicks, and is used, as a poor conductor of heat, for packing around steam pipes, valves, etc. The largest mines are in the province of Quebec, Canada.



Ash. [AS.] A genus of trees of the Olive family, mostly natives of Europe and of North America. There are about fifty species. The common ash is a beautiful and umbrageous tree, highly ornamental in parks, growing generally with a smooth stem to a height of from 100 to 150 feet, its wood being white, tough, and hard, in value next to that of the oak, and much used by wheelwrights, coachmakers, joiners, and turners. Among other varieties, the weeping ash, the curl-leaved ash, and the entire-leaved ash may be mentioned. The most important ones in the United States are the white ash, the black ash, the red ash, the blue ash, and the swamp ash. The white ash has the best wood, and is used for the same purposes as that of the common ash. The manna of commerce is a sugar from the sap of the manna ash, a kind of ash tree growing in Southern Europe, especially in Sicily, whence the finest manna is obtained.

Asp. [Fr., from Gk. *aspis*, an asp.] A small, hooded, poisonous serpent of Egypt and Libya, whose bite is often fatal.

Aspar'agus. [Gk. *asparagos*.] A plant grown in gardens for the sake of its young and tender shoots, which form a valuable and well-known article of food. The plants have erect, many-branched stems, and very slender branchlets, which are sometimes mistaken for leaves.

As pen. [AS. Bot. name *Papulus tremula.*] A species of poplar tree growing in Europe and in Siberia. It has received the specific name *tremula*, from the trembling of its leaves, which move with the slightest impulse of the air. The wood is white, soft, light, and smooth. It is not good for fuel, but is much in use for the turning-lathe, in making troughs, trays, and pails. The bark contains a bitter, alkaloid called salicin, and charcoal made from the aspen tree can be used in the manufacture of gunpowder.

As'phalt or **Asphalt'um.** [Gk. *asphaltos*, bitumen.] A kind of mineral pitch or compact native bitumen, found on the surface and shores

of the Dead Sea, which is therefore called Asphaltites, or the Asphaltic Lake. It is found also in Asia, Europe, and America, there being a very extensive lake-like deposit of it in the island of Trinidad, West Indies. It is brittle, and of a black or brown color; melts and burns when heated, leaving no residue.—*Asphaltic cement* is a composition of bitumen, pitch, lime, and gravel, used for forming pavements, and as a waterproof cement for bridges, roofs, etc. It has been of late years very largely used as a paving material in the United States and Europe.—*Artificial asphalt* is prepared from coal-tar, lime, and sand.

Ass. [L. *asinus.*] An animal closely allied to the horse, inhabiting the mountainous deserts of Tartary and other parts of Asia. It is smaller than the horse, and has long ears, an upright mane, a tufted tail, a streak along the back and across the shoulders, and gives a peculiarly harsh bray. The tame or domestic ass is remarkably hardy, patient, slow, and sure-footed, and has become the type of obstinacy and stupidity. The skin is hard and elastic, and is used for covering drums, making pocket-books, parchment, etc. It is of asses' skin that the Orientals make a kind of grained leather called shagreen.

As′teroid. [Gk. *aster*, a star, and *eidos*, form.] The asteroids are a group of very small planets between the planets Jupiter and Mars. Ceres, the first known of these, was discovered on January 1, 1801, the first day of the nineteenth century. Before the last day about 450 had been discovered. Nearly all of these are very small. Ceres is about 1200 miles in diameter, but many of them are only a few miles through. They may be fragments of a former planet, for they occupy the place in the solar system where, by the calculations of the astronomers, a planet should be.

Astrol′ogy. [Gk. *aster*, a star, and *logos*, a discourse.] The name of a system based on the science of astronomy, in which it is claimed that future events, and the coming fortune of any man, can be told from a study of the planets. The early astronomers were all astrologers, and watched the stars in order to predict the future from their movements. Astrology was widely believed only a few centuries ago, but now none but the ignorant have any faith in it, and it is professed only by rogues or fools.

Astron′omy. [Gk. *astron*, a star; and *nomos*, a law.] In its widest sense, it includes everything that is known concerning the heavenly bodies. It treats of their motions, relative positions, distances, magnitudes, mutual influence, constitution, and physical condition. The history of astronomy dates back to very remote ages. The Chinese, Hindus, Babylonians, and Egyptians each possessed some knowledge of the science, and had made some progress in astronomical observation many centuries before the commencement of the Christian era. It was first raised to the dignity of a science among the Greeks. The most eminent among ancient astronomers was Hipparchus, who discovered the precession of the equinoxes and other facts of importance. Ptolemy, the next astronomer of note, founded the system which makes the earth the centre of the universe, around which the mighty circle of the heavens revolves once in twenty-four hours. Copernicus (1473–1543) showed the error of this theory, and made the sun the centre of the solar system, the earth and the other planets revolving around it. The science has been much advanced by Tycho Brahe, Kepler, Galileo, Newton, Herschell, and many others of note, while the instruments of observation have increased in power until the universe has been explored to remote depths and hundreds of facts concerning its constitution discovered. Most marvelous among these are the vast number and immense distances asunder of the stars, and the wonderful discovery, which we owe to spectrum analysis, that our sun, and the fixed stars, which are the suns of other solar systems, are largely or wholly made up of the chemical elements found in the earth—such as hydrogen, iron, and others.

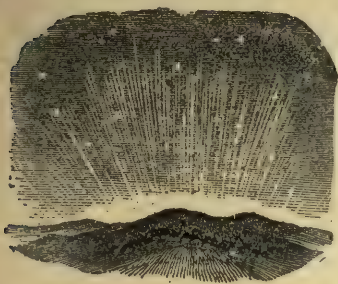
At′mosphere. [Gk. *atmos*, vapor; and *sphaira*, sphere.] The name of the great body of gaseous substance which surrounds the earth. The atmosphere consists essentially of two gases, oxygen and nitrogen, with a small quantity of carbonic acid and some aqueous vapor, with minute proportions of a few other substances. The vapor of water is of much importance in relation to the weather of any locality. The atmosphere being gaseous, obeys the same laws as gases under varying conditions of pressure and temperature. There is reason to believe that its extreme height may be not less than 500 miles, this result having been found by observations on the flight of meteorites. Air being a fluid, exerts pressure equally in all directions. This pressure, or the weight of the atmosphere, at sea-level, is equal to 15 pounds on every square inch of surface. It has been found that the average height of a column of mercury which will balance the pressure of the atmosphere is about 30 inches. (See *Barometer.*)

At′om. [L. *atomus.*] The smallest particle into which matter is considered to be divided. Atoms are inconceivably small, and are supposed to combine into molecules—containing two or more—which form the smallest chemical particles. The atom of each chemical element has a fixed weight, and tables of their weights, as compared with the hydrogen atom, are commonly given.

Au′ger. [AS.] A tool for boring holes, larger than those made by a gimlet. It has a handle placed crosswise, by which it is turned with both hands. The *pod-auger* and the *screw-auger* are the two principal kinds. The former has a straight channel or groove, while the latter has a twisted blade, by the spiral groove of which the chips are discharged.

Auro′ra Borea′lis, [L.] or **Northern Lights.** Luminous appearances which are seen in the northern quarter of the heavens. A muddy appearance of the sky in the direction of the north is the first indication of the approach of the aurora. This gradually resolves itself into a

band of a dusky hue, in shape like part of a circle, stretching from the north towards the west, with its ends resting on the horizon, and surrounded by a continuous luminous arch of transparent white tinged with green. The arch is in a state of continual movement, either rising and falling or swaying from east to west, and, starting from it, streams of light of brilliant and variegated colors shoot up towards the zenith. The most reliable measurements place the height of the aurora at from 45 to 100 miles above the earth. It is now regarded as certain that there is an intimate connection between the aurora and the magnetism of the earth, this being shown by the fluctuation of the magnetic needle during an auroral display, and also by the fact that the top of the luminous arch is found to be near the magnetic meridian. The aurora has been frequently observed to occur at both magnetic poles of the earth simultaneously. Auroræ are more frequent in North America than in the same latitudes in Europe. Thunderstorms and auroræ are connected with each other —the former being characteristic of the tropics, and the latter of the polar regions. In Norway, Siberia, and Lapland auroras enliven to some extent the snowy landscapes and brighten the long winter evenings, and they furnish much light during the protracted nights at the Arctic region.



Aut′omobile. [Gk. *autos*, self; L. *mobilis*, movable.] A self-moving carriage, distinguished at first as a horseless carriage. Steam and gasoline engines and electric storage batteries are used as propelling powers, and automobiles came rapidly into use near the end of the nineteenth century. A great development of them seems probable in the twentieth century.

Av′alanche. [Fr. from L. *ad vallem*, to the valley.] A vast body of snow, ice, earth, rocks, etc., sliding swiftly down a mountain side or falling down a precipice.

Axe. [AS.] An instrument of steel or iron, with a steel edge or blade, for felling trees, hewing timber, chopping and splitting wood, etc. The handle of an axe is called the helve, the thick metal part the head, and the hole for the handle the eye, and the handle is so fixed in the eye as to be in the same plane with the blade. The carpenter's axe for hewing timber is heavier than the chopping axe, and has a broader and thinner blade and a shorter handle.

B

Baboon′. [Fr. *babouin*, and *babines*, large lips.] A kind of monkey with a short tail, very fierce and dangerous, and not so often tamed as others of the Monkey tribe. It is found in the hottest parts of Africa and in Siam. Its long snout or lips give its head somewhat the shape of a dog's head. It lives chiefly on fruits, corn, and roots, and has large cheek pouches in which its food is kept until needed. The baboons are quadrupeds living on the ground, and running swiftly on all fours, while many of them live in herds, and are formidable to animals and property. The troops are led by patriarchs and guarded by sentinels, and fight fiercely when attacked. There are many kinds of baboon, but the best known are the pig-tailed, the dog-faced, and the mandrill. The nose and cheeks of the mandrill are ornamented with red and blue stripes, and its appearance is made remarkable by other patches of gaudy color.

Backgam′mon. [AS. or Dan.] A game of chance and skill played by two persons on a board with dice and fifteen pieces or "men" each. The board is divided into tables, each table being marked with six points colored alternately white and black. The moves of men are determined by throws of the dice; and if a point is occupied partially or fully by the opponent, the man is set back.

Ba′con. [Fr.] The back and sides of a pig salted. The hair is singed instead of being scalded, and the meat is separated from the shoulder-blade and bones, and cured by salting and drying.

Bacte′ria. [Gk. *baktron*, a rod or stick.] The name of a family of extremely minute plants, consisting of a single cell, and only visible under a high power of the microscope. They are found almost everywhere, and all fermentation and

putrefaction are due to them. While the most of them are harmless, and very useful in removing decaying substances, others are highly dangerous to life, forming the "germs" or "microbes" of contagious diseases. This fact was first discovered by Louis Pasteur, and gave rise to the science of Bacteriology. The harmful bacteria enter the body of animals, multiply with extreme rapidity, and give off poisonous products or toxins which cause violent and often deadly diseases. Among these are yellow fever, cholera, smallpox, diphtheria, malarial and typhoid fevers, and various others, also anthrax and other diseases of the lower animals. In the treatment, the use of anti-toxins, prepared by inoculating animals with weakened bacteria, has proved of much service, but the science of bacteriology is so recent that much remains to be learned.

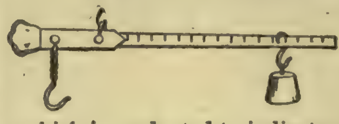
DISEASE GERMS

Badg′er. [Probably from *badge* and *ard*, in reference to the white spot on its forehead.] A carniverous quadruped of the Weasel family. It has a broad, flat body, short tail, and long tapering head. It is a quiet, harmless animal; but when attacked by dogs, turns on its back and defends itself with its teeth and claws. It burrows in the ground with its nose and fore paws, and forms a nest lined with grass and moss, from which it goes forth at night in search of food, which consists of roots, fruits, and small animals. It is found in Asia, Europe, and North America.

Bag′pipe. A musical instrument made of a leather bag, filled with wind by a tube blown by the player. There are other three or four tubes, one a chanter with eight holes. G-clef is the only scale used. It is an ancient instrument, and was known to the Greeks and Romans. It is the national musical instrument of the Scottish Highlanders, and is used in the Tyrol and in other parts of Europe.

Baking-Powders. Chemical substances used instead of yeast in bread-making, their action being to give off carbonic acid gas, which puffs up the dough, or causes the effect called "rising." They are usually composed of tartaric acid and bicarbonate of soda. A chemical action takes place in these in contact with the wet dough, and the gas is given off. Other substances are used, alum being common, though it is thought to be injurious; also acid phosphate of calcium. The use of baking-powders has grown enormously in recent years, and yeast is little used.

Bal′ance. [L. *bis*, double; and *lanx*, a dish.] A machine used for weighing. The common balance consists of a beam supported at its middle point, having two scale-pans of equal weight hung from its extremities. The object aimed at in its construction is to secure delicacy and rapidity in weighing. Of other forms of lever, the Roman balance, or *steelyard*, consists of a rod suspended from a fulcrum, so that the two arms are of unequal length. The substance to be weighed is suspended from the shorter arm, and a moveable weight slides along the longer arm,



which is graduated to indicate quantities. This form of balance is in use at railway stations for weighing luggage and loaded carts. The spring balance shows the weight of a body by the extent to which it stretches a spiral spring.

Balloon′. [Fr. *ballon*.] A large bag made of silk, and filled with light gas, coal gas being now generally used. It rises in the atmosphere, because its weight is less than the weight of air which it displaces. A car, supported by a network attached to the balloon, carries the aeronauts; when they wish to ascend more quickly, they throw out some of the ballast, which consists of bags of sand; when they wish to descend, they open a valve at the top, which allows some of the gas to escape. Ascents have been made to determine the pressure and temperature of the air at different heights. In some cases balloons have risen to a height of five miles, and in one instance to seven miles. Balloons have been used as aids in war, and are now being applied in flying machines.

Bal′sam [Arab.] or **Balm** [Gk.] A liquid aromatic substance, of resinous character, which under the name of Balm of Gilead has long been famous in the East for its fragrance and medicinal virtues. It is the product of a shrub growing in Arabia and Egypt. The word balsam, when used alone, now signifies the balsams of Peru and Tolu, a viscid and very fragrant liquid, obtained from two species of South American trees. They are used to flavor confectionery, also in perfumery, and as stimulants and tonics in medicine. Balsam of Canada is the liquid resin of *Abies balsamea*, a species of fir. There is also a genus of trees in the East Indies and Japan known as balsam, of which some species are of great beauty and are widely grown elsewhere. [See *Gums*, *Resins*.)

Bamboo′. [Malay.] This is the giant of grasses. It is a most useful and graceful plant. Its stem is hollow, and at intervals it forms joints or knots; and its flower is enclosed in scales, as in the common grass. It grows everywhere in the tropics—in China, India, and the valleys of the Andes. There are many kinds—the most common being from 40 to 80 feet long, and of any thickness up to 20 inches. Many stems rise from the same root or from the higher joints.

Young shoots contain a sweet pith, and are eaten as asparagus. With the stem the Malay builds his house, and furnishes it with chairs, tables, beds and bedding of the same material. It is made into sails, cables, hats, paper, fishing-rods, pipes, bridges, flutes, handles of tools and weapons, buckets and bottles.

Bana'na. [Span.] The fruit of a tree of the same name, belonging to the same family as the plantain. Its leaves are about 6 feet long, and its fruit grows in great bunches and is a most important food in hot countries. Its fibre is used for shoe-strings and for ropes of all kinds. The banana was probably first grown in the East Indies, but is now much cultivated in the West Indies and in tropical America. Its produce is enormous, being estimated on an acre as 133 to 1 of wheat. A plant of the same genus, in the Phillipine Islands, yields the well-known and very useful fibre named Manila hemp.

Bandan'a. [Hind.] A red or colored silk or calico handkerchief with patterns or white spots. The handkerchiefs are pressed between hydraulic plates with holes or patterns, and the bleaching fluid poured into these holes passes through and produces the spots or patterns.

Ban'yan. [Bot. name, *Ficus Indica*.] The sacred tree of India, and one of the wonders of the vegetable world. It is of the Fig family, and is called the Indian fig. Its seeds carried by the wind or dropped by birds are often deposited in the crowns of palms, and send down roots which become stems, in time taking the place of the palm. These grow to trunks from 60 to 100 feet in height, from whose branches in time, pendulous adventitious roots descend to the ground and in their turn become stems. This process continues until a single tree spreads over acres of ground and becomes a wood in itself. At Nerbudda, India, there is a tree with 354 large trunks and 3,000 small ones, which is inhabited by great numbers of birds, fruit-bats and monkeys, the latter eating the leaves as well as the fruit. The Brahmins of India hold the tree in great reverence, and build their temples in its vicinity.

Ba'obab. A tree of tropical Africa; known also as the monkey-bread tree. Its size is gigantic, and it lives to a great age. Its trunk does not usually exceed 40 feet in height, but its girth sometimes reaches 75 feet. Its branches are from 50 to 75 feet long, and touch the ground. The fruit is abundant, and of the size of a citron, its pulp being pleasant and slightly acid. The juice sweetened with sugar, makes a cooling and refreshing beverage. The bark yields a very strong fibre.

Bar'berry. [L. *berberis*.] A shrub which grows wild in northern Europe and Asia and in parts of the United States. In Italy it grows to the height of a plum tree, and is very ornamental when covered with its bright red berries. These are very sour, but make a pleasant drink, and good preserves and jelly. A fine yellow dye for leather is made from the bark and roots.

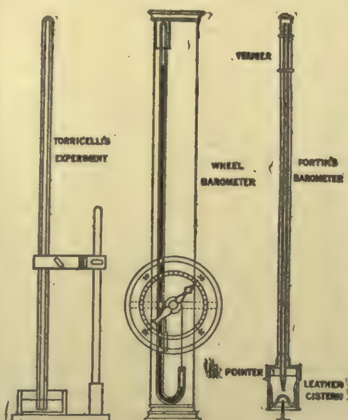
Ba'rium. [Gk. *barys*, heavy.] One of the metallic elements, first isolated by Sir H. Davy, from whom it received its name. It occurs in *heavy spar* (sulphate of barium) and in baryta (a compound with oxygen). Some of its compounds are used in the preparation of fire-works.

Bark. [Dan.] The exterior covering of the trunk and branches of exogenous trees, the endogens and the ferns having no true bark. Some barks are very thin and others thick; those of the giant trees of California are two feet thick. The outer bark protects an inner bark. In many trees the outer bark is coarse, and has no life in it. The inner bark is fresh and full of sap. The sap which goes up through the wood of the tree from the roots to the branches comes down through the inner bark. Bark is useful for dyeing and tanning leather, and certain kinds are made into corks. Quinine is made from Peruvian bark. (See *Cinnamon*, *Cork*, *Exogen*.)

Bar'ley. [AS.] A plant of the Grass family, cultivated for its seeds, which are a valuable grain used for food. It is hardier than wheat, maize, or oats, and is grown in northern countries like Russia, Norway, Denmark, Scotland, etc., being found as far north as latitude 70°. Barley is a shallow-rooted plant, drawing its plant-food mainly from the surface layer by curious root-hairs. Barley-meal is used for fattening pigs and cattle, and when boiled, horses also. Barley is mostly used in brewing beer and ale, and in distilling spirits.

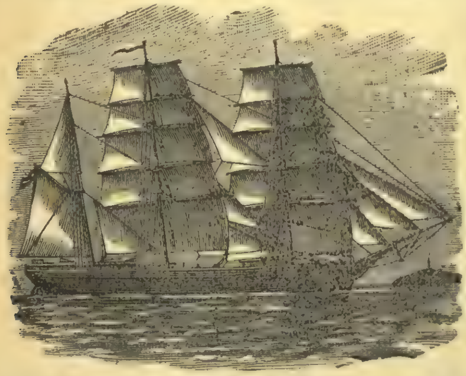
Bar'nacle. A genus of ocean animals, called also acorn shells. These belong to the order of the crustaceæ, swim when young, but afterwards attach themselves to rocks, ships, sea plants, etc., develop a shell, and become fixed for life. They gather thickly on the bottoms of vessels in the tropics and much impede their speed.

Barom'eter. [Gk. *baros*, weight; and *metron*, measure.] An instrument for measuring the pressure of the atmosphere. Barometers are divided into two classes, *cistern* and *siphon;* and in each of these classes there are several forms. The simplest form of the cistern barometer consists of the Torricellian tube, with the addition of a graduated scale to show the height of the mercury column. In ordinary weather-glasses, the tube is bent round at the bottom, and the cistern is an expansion of the tube. At the upper end of the tube is a fixed scale of inches, and



tenths of inches, beginning with 27 and ending at 31 inches. A vernier slides along the fixed scale for measuring fractional divisions. In the *siphon* barometer the tube, which is generally of uniform bore, is bent into the form of a siphon, the longer leg of which is closed and the shorter opened. Of the various forms of this class, that known as the *wheel* barometer is the most common for household use. In this the rise and fall of the mercury turns a small wheel, which moves a pointer and dial. The wide sweep of the pointer makes small changes in the height of the mercury very evident. One of the important uses of the barometer is that of measuring the heights of mountains. The pressure of the air on the top of a mountain is less than that at the bottom by the weight of the column of air intervening between the top and the bottom. The difference between the readings of the barometer at the foot of the mountain and the readings on the top gives the means of calculating its height. The most important of all the uses of the barometer is its employment for meteorological observations.—Aneroid Barometer. (See *Aneroid.*)

Barque, or Bark. Any small ship, but especially a vessel, small or large, with three masts, the



fore and main of which are rigged as in a ship, but the mizzen is rigged fore and aft.

Bar′rel. A cylindrical receptacle made of grooved staves bound together by hoops, and with heads fastened by dowels. The staves are planed, bent, and grooved by machinery. The name *barrel* includes keg, cask, pipe, hogshead, and butt. Over 1,300 millions of staves are made annually in the United States, chiefly of red and white oak and elm.

Basalt′. [L. *basaltes.*] A rock of igneous origin, occurring chiefly in the ancient trap series of rocks. Basaltic rocks are composed of feldspar, augite, and magnetic iron, and other minerals, such as *olivine.* In color they are blue, brown, and black. They occur both as lava-flows and as sheets or dikes intruded between other strata, and are sometimes found in columns, which may be perpendicular or inclined, and of regular or irregular structure, as at the Giants' Causeway in Ireland.

Base-ball. An athletic game, which takes the place in the United States that cricket holds in England. It is played on a square area, whose corners are called bases. The ball is struck by a bat, and the batsman seeks to run from his station to one or more bases before it can be returned by the opposing players in the field. The party making the greatest number of runs round the complete square wins the game. There are nine players on each side, including the pitcher, batsman, catcher and fieldmen.

Bask′et. The weaving of wicker work is one of the oldest arts known to man. The shoots of the willow or osier are mostly used. Ash, elm, and birch shoots are also used. Baskets are made of a great variety of shapes and sizes, and basket work is used for various other purposes, such as screens, chairs and pony carriages. Boats have been made of basket-work covered by skins, and the ancient Britons used basket shields.

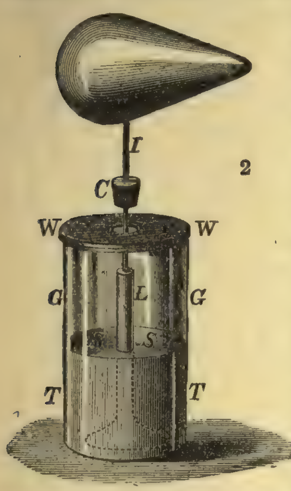
Bass. [A corruption of *barse.*] A spiny-finned kind of perch used for food. There are many kinds, including the black and rock bass and sea bass of America, the common European bass, the striped bass, the white or silver bass of the American lakes, and the brasse or yellow bass. The black bass builds on the bottom a saucer-like nest, where it deposits its eggs, and where, when hatched, the fry are carefully protected.

Bat. [O. E.] An animal with wings of a thin membrane of skin. The finger bones are very long and slender, and the membrane is stretched between them and extends from the arms to the legs. It is filled with nerves, so that blind bats can fly with as much confidence as those that have the use of their eyes. The Bat family is called *Cheiroptera*, or wing-handed animals. They feed on minute insects, and sleep during the day in old ivy-covered buildings, hollow trees or caves. When sleeeping the bat suspends itself with its head downwards, and hangs by the curved claws of its hind feet. If it alights on the ground, it has difficulty in taking to the wing; but when hanging it unhooks itself, and its wings are at once free to strike the air. The collared fruit bat of India is from its size and color named the flying-fox, and feeds on fruit. Fruit bats suspend themselves by one foot when sleeping, tucking the other foot under the wing. Vampire or blood-sucking bats inhabit tropical America. They bore little holes in the skin of their sleeping victim, or shave off a piece of skin. (See *Guano.*)

Baths. [AS.] Places for washing in, either for cleansing the skin or strengthening the body. For cleansing, tepid or warm baths are most effective; but being relaxing, they should not be used too often. The cold morning bath, either plunge, or sponge, is very beneficial to healthy persons. Sea-bathing is preferable to bathing in spring water. Turkish baths and electric baths are now in favor among rheumatic patients. Roman baths embraced swimming-baths, warm baths, baths of hot air, and vapor-baths. Other baths, as Russian, mud, douche, etc., are medicinal or of the nature of luxuries.

Bat′tleship. This term refers to a heavily armored ship of war, carrying immense guns, which are placed in revolving armor turrets. One of these ships is like a floating fortress. They differ from the cruiser, which has thinner armor and lighter guns, and is built for greater speed.

Bat′tery, Ley′den. An electric battery, consisting of a number of jars joined together in such a manner that they act like a single large jar. The jars are placed side by side in a box or tray lined with tin-foil, which thus unites their outer coatings with each other and with the ground, while their inner coatings are connected by brass rods, joining together the knots of the jars. They are used to accumulate a strong charge of static electricity. The parts of a jar are: TT tin-foil; SS sulphuric acid; L leaden rod, with upper part I of iron; W wooden cover, closed by the cork C, to keep out the dust when not in use.



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Bay′onet. [Fr. *bayonnette.*] A sharp, straight, tapering steel pike or sword, capable of being fastened to the muzzle of a musket or rifle. It is named from Bayonne in France, where the first was made about 1640.

Beads. [AS.] Perforated balls of glass, porcelain, or gems worn for ornament; also a small ball for counting prayers. The glass houses of the island of Murano, near Venice, have been, from a remote period, a centre of the manufacture of glass beads. Upwards of five thousand people are there employed in this industry. Beads are much used for fancy work. "Bugles," or long beads, were formerly used, but now jet beads are common for trimming ladies' dresses.

Bea′con. A signal fire, or an erection at the entrance of a river or harbor, to give warning of dangerous navigation. Beacon fires are of great antiquity, and by their use news were quickly flashed from hill to hill across a wide area. Iron pots to hold the beacon fuel were often placed in church towers.

Beak. The point of anything; the bill of a bird. The beak is a conspicuous feature in all birds, and consists of an upper and lower half. The upper half is commonly articulated with the skull in a more or less immovable manner. The parrot possesses this feature in its greatest perfection, but it exists in a less complete form in many birds. In no recent birds are teeth ever developed, though rudiments of teeth have been recognized in some parrots, and fossil birds have been found with well-developed teeth. The beak of each bird is beautifully adapted to its habits. Beaks of land-birds are hard and horny—in the woodpecker like ivory. In many water-birds the beak is rather of a leathery texture. The beaks of birds of prey which feed on flesh are strong, hooked, and pointed, those of herons and storks, which feed on fish, are long, pointed, and sharp; the beak of the parrot, which feeds on nuts, is adapted to crushing the shell and picking out the kernel; the beak of the duck is flat and broad, with comb-like fringes on the upper jaw which fit into the lower jaw. In the puffin and similar birds part or the whole of the horny sheath is annually shed.

Bean. [AS.] The seed of various pod-bearing plants used for food. The two principal field beans are the Scotch or horse bean, and the tick bean. There are also many varieties of garden beans, such as the long pod and broad windsor. The bean is a valuable source of food for men and the domestic animals and is grown in most of the temperate climates of the globe, being used as human food in its unripe state and as food for animals when ripe. French or kidney beans are grown for the green pods. Haricot beans, which are almost the same as French beans, are largely grown in France and Italy. The Lima bean is a variety of the pole-bean.

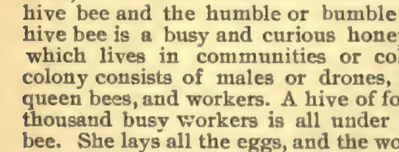
Bear. [AS.] A large carnivorous animal, with a rough, shaggy coat and a peculiar gait. It walks on the sole of the foot (plantigrade.) It has five toes on each foot, and when fighting stands nearly erect on its hind feet, and strikes with the fore paws or clasps its antagonist forcibly. Though a flesh-eater the bear prefers vegetable food, and is fond of the fruit and roots of trees. Most bears are good climbers of trees. The bear partially hibernates, the female shutting herself up when with young, and being without food until the following spring. The brown bear of Europe and Asia is sometimes exhibited as a performing animal. There are also the black bear and grizzly bear of North America, the sloth bear of India, the Syrian bear of Scripture, and the polar or white bear, which, with its yellowish fur, lives among ice, and is a good swimmer, and preys on the seal and walrus. The ant-bear, the sea-bear, etc., are not real bears, but belong to quite different orders of animals.

Bea′ver. [AS. L. *fiber.*] An interesting rodent animal, valued for its fur. Formerly abundant in North America, it is now scarce, and found

only inhabiting the banks of rivers in wild parts. The hind feet are webbed for swimming, and it has a curious broad tail, flattened like a paddle, which is used as a rudder. It builds lodges of branches and mud about 3 feet high and 7 feet in diameter, and is very sagacious in making a dam or artificial bank of wood, stones and clay, to protect the lodges. The entrances are at all times beneath the water, so that the animal can enter or leave its home in safety. Its powerful teeth are its chief tools, and it cuts down trees of great size by gnawing a groove all round, so that they fall as it desires, and it then cuts them into lengths. The food of the beaver is the bark of trees, and it lays up a store for winter by cutting branches and sinking them under water, placing stones on them. The fur of the beaver was formerly used for hat-making, but is now used for trimming ladies' cloaks and for gloves; and the material called castor is obtained from two small bags in the groin of the animal.

Bed. [AS.] Something to rest or sleep on. Many substances have been used for this purpose, such as skins, heath and rushes, straw, etc. Feathers have long been used. The East Indians lie on the floor on light mattresses, the Japanese on matting, the Chinese on low bedsteads. In Europe, bedsteads are used with two mattresses —the upper being made of hair or down, and the lower of cotton. The best beds are made with steel springs, covered with a hair mattress. These are coming largely into use, for hygienic reasons, the feather bed not being conducive to health, while the close bed-curtain has been generally discarded. Folding beds, which by day look like a desk or other article of furniture, are now much used.

Bee. [AS.] A family of membrane-winged insects, of which the best known are the honey or hive bee and the humble or bumble bee. The hive bee is a busy and curious honey-gatherer, which lives in communities or colonies. A colony consists of males or drones, females or queen bees, and workers. A hive of forty or fifty thousand busy workers is all under one queen bee. She lays all the eggs, and the workers keep close guard over her. They also are females, but as a rule lay no eggs. The drones have no sting, and neither work nor defend their nest. They number about one-thirtieth part of a hive, and are all slaughtered by the workers during the latter part of summer. When well kept, bees collect more honey than is necessary for themselves and their young, and the excess is the honey used by man. The queen never works, but the workers gather the pollen and nectar from various flowers. (See *Honey*.) They have the sense of smell, for they scent the nectar or



LEG OF BEE.

honey at great distances; and, like other insects, they have curious compound eyes, composed of thousands of small eyes. The mouth of the bee is well adapted to the work. It has a long lip and a much longer tongue. With the latter it probes the flower-cups and licks up the nectar which in its honey-bag becomes honey. In the hive, bees gather in thick clusters, hanging from the top, the first suspended by its fore claws, and the others holding to one another by the legs. In twenty-four hours small scales of wax appear on their under parts. The workers shake the wax from their bodies or pick it out of their pouches with their feet; they then take it in their jaws, work it over with saliva, and from it build cells in double rows. These cells are called the honeycomb. Artificial wax combs are sometimes used, and the bees fill them with honey. Pollen is also gathered for bee-bread. The worker scrapes the pollen and packs it into little baskets at the middle joints of its hind legs. Bee-bread is pollen mixed with honey for ordinary food and to feed the young. Cells are hexagonal in shape, and so have strength and economize space. The cell of the drone is larger than the cell of the worker, and that of the queen bee is larger than either. The queen bee places a single egg in each cell —worker-eggs in worker-cells, and drone-eggs in drone-cells. The workers seal up these cells, leaving little holes for air to enter when the young shall be hatched, while honey-cells are always sealed tight to keep out the air. The eggs become grubs or larvæ, which spin about themselves silken cocoons, and in twenty-one days after the eggs are laid, full-grown bees, both workers and drones, come forth. The queen grubs remain still in their cells, and are guarded and fed by the workers. The old queen, jealous of these royal prisoners, becomes excited, and a large number of bees fill themselves with honey, and, joining the old queen, "swarm" or leave the hive, and settling on some branch, are put into a new hive.

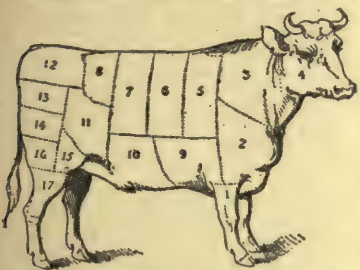
The *humble-bee* (L. *Bombus*), having a longer tongue than the honey-bee, reaches the nectar of the red clover flower, and, carrying pollen from stem to stem, enables it to bear seed. The New Zealand farmer tried to raise clover, but failed till humble-bees were imported. The humble-bee and wasp have communities like the honey-bee, but the number of the males equals the females, and the males work actively and defend

the nest. Bees fortify their nests against the sphinx moth and other enemies.

The *carpenter bee* is a solitary bee. She bores her nest in old wood in the shape of a tube, which takes a sudden turn and is continued down the trunk parallel to the grain of the wood. This tunnel she divides by sawdust partitions into cells, in each of which is placed an egg with a supply of food for the young larva. Large quantities of bees-wax are used for making candles, and also for artificial flowers and fruit.

Beech. [AS.] A tree of the *Fagus* family, growing in Europe and America to a large size. It has a smooth bark and thick foliage, and bears triangular nuts which yield an oil. These nuts are used to feed swine. The wood is made into shoe lasts, mill wheels and tool handles.

Beef. [Fr.] The flesh of an ox or cow when slaughtered for food. Beef contains fibrin and albumen, which are good flesh-forming materials, and the value of meat is chiefly due to the presence of these two substances. The methods of cutting up an ox into beef vary in different countries. In this country it is cut up into 17 parts—(1) shin, (2) clod, (3) neck, (4) cheek, (5) chuck rib, (6) middle rib, (7) fore rib, (8) sirloin, (9) shoulder, (10) brisket, (11) thin flank, (12) rump, (13) aitch or edge bone, (14) buttock or round, (15) veiny, (16) mouse buttock, (17) leg. Corned beef is made by soaking lean parts in a pickle of saltpetre and sugar.



Beer. (AS. *beor;* Ger. *bier.*] Under this name may be included beer, ale, and porter. The process of making beer is called brewing. Barley is soaked in water and kept in a warm place until it begins to sprout. During this process the starch in every grain of barley is changed into saccharine or grape sugar. The sprouting is stopped by drying the grains, and the barley is then called malt. This done, the malt is crushed and boiled in hot water, which dissolves the sugar. The sweet liquid so got is called wort. Hops are added to the wort. They give an agreeable taste to the beer and help to clear it and to keep it. Next a little yeast is added which causes it to ferment. Fermentation converts the grape sugar into carbonic acid gas, which escapes into the air, and alcohol, which remains in the beer. In 100 lbs. of beer there are from 4 to 8 lbs. of alcohol, 4½ lbs. of dextrin, ½ lb. of albuminoid matter, and from 80 to 90 lbs. of water.

Beet. [AS.] A biennial vegetable plant which produces an edible root the first year and seed the second year. There are many varieties; the red is used for the table, the mangel-wurzel for feeding stock, and the white in making sugar. Beet-root sugar is equal to that made from the cane, and is made in immense quantities in Europe, where more than 4,000,000 tons are produced annually. This industry has been introduced into the United States, but has as yet made no great progress.

Bee′tle. [AS.] Any insect of the order *Coleoptera* (or wings in a sheath), having four wings, the outer pair being stiff cases for covering the others when folded up, and defending them from hard substances underground. The black beetle is the common large cockroach. The

curculio or weevil lives on fruit or grains; tiger-beetles are striped; carrion-beetles live on dead animals; the Spanish-fly is a bright-green beetle; stag-beetles have long jaws. The turnip-fly or flea-beetle and click-beetle are destructive to crops. There are many thousands of different species of coleoptera, and they vary very much in size and appearance.

Bego′nia. [From Michael Begon, a botanist.] A species of plants grown as ornamental plants. The leaves are curiously one-sided and often exhibit brilliant colors.

Bell. [AS.] A hollow metallic vessel shaped like a cup, with a wide mouth containing a clapper or tongue, and giving forth a musical sound when struck. Bells are made of various metals, but the best are made of an alloy of copper and tin. The large bell of Moscow is 19 feet 3 inches high; the bell of Kioto, Japan, is 24 feet high.

Belladon′na. [Bot. name *Atropa belladonna.*]. A herbaceous plant with reddish bell-shaped flowers and shining black berries. Both plant and fruit are poisonous, and used as powerful medicinal agents. Also called *nightshade.*

Bel′lows. [AS.] A flat, round, double utensil, which by the rise and fall of the top part draws in air through a valve and expels it through a tube. Useful for blowing fires, ventilating mines, and filling the pipes of an organ and some other musical instruments with wind.

Ben′zene. [Arab. from *benzoin.*] A compound of carbon and hydrogen discovered by Faraday. It occurs amongst the products of the distillation of many organic bodies, but its chief source is

coal-tar. It is a thin, limpid, colorless liquid, emitting a pleasant odor. It dissolves easily in alcohol, ether, turpentine, and wood spirit, but is insoluble in water. It is of value from its great power of dissolving gutta-percha, wax, camphor, and fatty bodies. Impure benzene is used for removing grease stains from silk or woollen articles of dress.

Ben′zine. A substance derived from petroleum, which is much used as a substitute for turpentine and for dissolving oils and fats.

Ben′zoin. [Arab.] A vegetable substance obtained by drying the juice of the benzoin tree. It is brought from Siam and the islands of the Indian Archipelago. It is used in perfumery and as incense, being fragrant and aromatic, and also in medicine. A compound tincture is prepared from it, known as Friar's Balsam, and is used for dressing wounds.

Berg′amot. [It. *bergamotta;* prob. from Turk. *beg armudi*, a lord's pear.] A tree of the Orange family, having a pear-shaped fruit, from the rind of which is extracted an essential oil with a delicious and much-prized perfume called oil of bergamot. This oil is used in perfumery and in making liqueurs.

Ber′yl. [Gk. *beryllos.*] A mineral found in granite together with topaz. It is of a light-green color. It crystallizes in six-sided prisms; is very hard and difficult to fuse unless mixed with some other substance, such as borax; and consists chiefly of alumina, silica, and glucina. It is found in India, Brazil, Peru, and Siberia.

Be′tel. [Tamil.] A climbing pepper, the leaves of which, mixed with lime and areca-nut, are chewed by the inhabitants of the East Indies, and the Malays. It stains the lips red and teeth black.

Bevel Wheels. Wheels the axes of which are not parallel, but inclined at a certain angle to one another. When the axes of the two wheels are at right angles they are called *mitre wheels*.

Bi′cycle. [L. *bis*, twice; and Gk. *kyklos*, a circle.] A two-wheeled velocipede propelled by treadles attached to cranks or levers. It has become a favorite vehicle, both in Europe and the United States, from its rapidity of motion and the ease with which it can be propelled.

Bil′iards. [Fr.], The king of indoor games. It is played with balls and a cue on a table, with pockets at the sides and corners. The player seeks to impel his ball to strike or cannon two other balls, or drive another ball into the pockets. The French game is cannon only, and is played on a table without pockets. The American game is played with four different colored balls. Pyramids is played with fifteen red balls arranged in a triangle, and a white ball; in pool there are as many balls as players.

Bi′ograph. [Gk. *bios*, life; *graphein*, to write.] An instrument for the reproduction from photographs of seemingly living forms. The photographs are taken on a film in such rapid succession that every phase of movement of the figures is caught as a separate picture. To produce the effect of life the film with its successive pictures is run rapidly through a lantern arrangement, they being thrown on a screen in such quick succession that they blend to the vision and produce a remarkable vivid representation of actual life movements.

Birch. [AS.] A tree of several species belonging to the genus *Betula*—as the white or common birch—the most widely diffused, the dwarf birch, the paper or canoe birch, the yellow birch, and the black or cherry birch. The common birch is called silver birch or lady birch; it has small green leaves, elegant drooping boughs and silver-white bark, and grows on the bleak mountain side. From the bark of the common birch an oil is obtained which is used in the preparation of real and imitation Russian leather; also a resinous substance called birch camphor or betulin is got from the outer bark of the tree. The birch of Jamaica is a kind of turpentine tree. The dwarf birch is a mere bush, and is the last shrub found on drawing near the eternal snow of the pole. Dye is prepared from birch leaves; and the wood makes good charcoal for gunpowder, and is used for smoking hams and fish. The wood is used by cartwrights, upholsterers, and turners; and the bark being impervious to water, is used for canoes and for preserving roofs. An oil similar to winter-green oil is prepared from the black birch.

Bird. [AS.] A winged vertebrate animal covered with feathers. Birds easily mount up into the air, their bones being of all animals largest in proportion to their weight, and the quills of their feathers filled with air. These communicate with a series of sacs or air-chambers connected with the lungs. In birds which fly much the neck

is stretched forward like a wedge, the breast bone is extended like the keel of a ship, and the wish-bone, which is the collar-bones joined into one, is much developed. In birds such as the ostrich, which run chiefly, the wish-bone does not grow. When a bird perches and bends its knees, the weight of its body pulls a large ribbon-like cord in its leg, which makes its toes clutch the perch. As it sleeps its body falls forward; and the further forward it goes, the closer do the toes cling, so that it does not fall off. The heart of a bird has four chambers, with perfect circulation. The temperature of the blood of birds is very high (104°) while that of the human body is 98°. Their bodies retain this heat through the non-conducting nature of the down and feathers with which they are covered. Feathers (*q. v.*) are modified hairs, and are shed annually. Birds are then said to moult. The bones of the neck vary in different birds. The sparrow has nine, the swan has twenty-three.

The necks of birds are thus flexible and strong, and their heads may be turned easily, or put under their wings when they go to sleep. The back-bone of a bird is inflexible, and practically one bone. The place of teeth in animals is taken in birds by the horny growth called the beak (*q.v.*) Tropical birds have the most beautiful plumage. Birds usually migrate in flocks to warmer countries on the approach of winter, returning in spring, many of them being very swift in flight. All birds build nests in which their eggs are laid and their young hatched, the young being cared for in the nest until able to fly. Birds' nests are made of a great many different materials—such as straw, sticks, hay, moss, leaves, clay, wool, hair, and feathers. The outside of the nest is rough and strong, for it has to keep out the wind and the rain. The inside is generally soft and warm, like a bed. The nests of different species of birds vary greatly, from the neat little nest of the wren, with a hole in the side for an entrance, to the hole in a tree in which the woodpecker lives, the swallow's nest of dry mud, and the eagle's nest of woven sticks. Some birds build their nests in trees, some in bushes, some in hedges, some among the grass of the field, and some in the corners of windows and under the eaves of houses. Birds are classified according to their beaks and claws, which vary greatly with their habits. There are swimmers, waders, runners, scratchers, climbers, perchers, and birds of prey. (See *Beak*, *Claw*, *Feather*, *Foot*, *Wing*.)

Bird of Paradise. A perching bird allied to the bower-birds. It has wonderfully beautiful plumage and remarkable tail-feathers, which are much prized for ladies' hats. There are twenty kinds. They live only in New Guinea and the adjoining islands.

Bis′cuit. [Fr. *bis cuit*, twice baked.] Originally biscuits, which belong to the class of unfermented bread, were deprived of their moisture by being twice baked; but although that process is no longer employed, the name is retained. Ship biscuits are made of wheat flour, from which only the coarsest bran is separated. Fancy biscuits are made from fine flour, to which eggs, are added with ginger, almonds, or other spices. (See *Bread*.)

Bis′muth. [Ger.] One of the metallic elements. It is found in small quantities, in the native state, in Cornwall, France, Germany, Peru, and Siberia, but is chiefly prepared from its ores, which are found in Saxony and Cornwall. Pure bismuth crystallizes more readily than any other metal, and its density decreases under increased pressure. Fusible alloys containing bismuth have been to some extent used as safety-plugs for steam boilers, in addition to the safety-valve. The compounds of bismuth are also used in medicine and as pigments.

Bi′son. A large animal of the Ox family, of which only two species remain, one in America and one in Europe. Its most striking difference from the ox is in the hump behind the neck, the longer limbs and shaggy head and shoulders. The American bison, commonly but wrongly called buffalo, was formerly very abundant, but has been nearly exterminated. Of the European bison only one herd remains. The bison is about 10 feet long, 6 feet high, and is very strong.

Bit′tern. A wading bird of the Heron family, now very scarce in England. It has a *booming* cry, which when heard at night sounds so dismally that the bird has been named the night raven. The American bittern is called the stake-driver or meadow-hen.

Bitu′men. [L.] A combustible mineral which emits a strong odor when burning. It is supposed to have been produced by the action of heat on coal, and is essentially the same as petroleum and naphtha.

Black′berry. The fruit of the prickly bramble bush, called in England the brambleberry. The plant is of the same family as the raspberry. It grows all over Europe and Asia, and is abundant in North America. In the United States are the high-bush and low-bush blackberries, and the creeping dewberry, all growing wild. There are also several cultivated varieties, bearing larger and finer berries. The fruit is eaten for dessert, made into jelly, jam, and preserves, and wine and brandy are made from it.

Black′bird. A singing bird which is a species of thrush. In England it is sometimes known as the merle, and its fine note makes it a favorite; but not with the gardener, who blames it for its fruit-eating propensities. In America there are the crow-blackbird or purple grackle, the red-winged blackbird, and the cow-bird.

Black-lead. The substance called by this name has no lead in its composition, but consists of graphite or plumbago, one of the forms of carbon. It gets its name from the mark it makes on paper, like that made by lead. The best known is found at Ticonderoga, New York, this being of almost pure carbon. It is used to make lead pencils, being ground and compressed into shape. It is also used for stove blacking, mixed with clay to form crucibles, which have to stand great heat, and for other purposes.

Black-snake. A species of snake common in the United States and one of the largest found there, measuring sometimes over six feet in length. It is of a leaden color, is very swift in its movements, and readily climbs trees. Though it bites readily, it is not poisonous, and is an enemy to the rattle-snake, which it coils around and crushes to death. It feeds on small animals, seeks eggs in the poultry-yard and milk or cream in dairies. It is easily tamed.

Blank′et. [Fr.] A heavy, loosely-woven stuff, usually of wool, and having a nap, used in bed-clothing, as a robe, or as a cover for a horse.

Blast-furnace. A furnace for smelting ores into which air is forced by pressure. The terms *hot blast* and *cold blast* are used to indicate whether the current is heated or not heated before entering the furnace.

Blast′ing. The blowing asunder of rocks or other hard material by means of explosives. In this work gunpowder is now largely displaced by the more powerful dynamite or other newly-discovered explosives. Blasting holes are now largely made by steam-drills instead of by hand, and the electric spark is much used in exploding the charge. Some of the new explosives are exceedingly powerful in their rending effect.

BLAST FURNACE.

Bleach′ing. [Fr.] The process of removing the color from textile fabrics and from many other materials used in the arts, such as oil, wax, and the various substances used in paper-making. The old method of bleaching was carried on by exposing the materials to the action of the sun's rays, while they were kept damp by frequently sprinkling them with water; but since the discovery of the bleaching action of chlorine about one hundred years ago by Berthollet, a French chemist, bleaching has become a thoroughly scientific process. The two chief bleaching agents are bleaching-powder (or chloride of lime) and sulphurous acid.

Blood. [AS.] The vital fluid of animals, which circulates through tubular vessels known as arteries and veins. This fluid is largely water, but contains the nutriment derived from the food we eat. The arteries carry the bright-red blood which feeds the system. The veins bring back dark-colored blood, filled with waste substance from the body. Arterial blood is bright red and life-giving. Venous blood is black-looking, and destructive of life until purified by the lungs (*q.v.*) From the extremities of small arteries the blood enters the thread-like capillaries, where nutrition takes place. These capillary tubes convey the blood to every part of the muscles and bones, to the root of every hair and every part of the brain, and throw it into the veins, so that it may go back to the heart (*q.v.*). Blood, though red in appearance, is a clear liquid without color, in which are particles or corpuscles so minute that the aid of a powerful microscope is required to examine them. Some corpuscles are red, others are white, but the red are so numerous as to tinge the fluid red. Oxygen from the blood unites with particles of tissue, and burns them, causing both the heat and the motion of the body. Exercise makes us warm, because the air is inhaled more rapidly, and the blood passes more rapidly through the lungs in contact with it, and so more oxygen is introduced into the body. The blood circulates through the body once in about two minutes, or about 12 lbs. of blood pass through the heart every minute. Every time the heart contracts it sends a fresh supply of blood to the blood-vessels, and the motion gives a pulsation to the system. This is distinctly perceived at the pulse in the wrist, because there a rather large artery lies near the surface. The temperature of the human body is 98°, that of birds is 104°, and that of fish is 85°.

Bliz′zard. A winter storm common on the western plains of the United States, its characteristic being a strong and very cold wind and fierce blinding snow. It usually appears in the Canadian plains, following a very low barometer, and spreads over a wide area. Blinded by the snow, many people lose their lives. In the blizzard of January, 1888, about 235 people perished. Blizzards rarely visit the East, but on March 12, 1888, one occurred in the country about New York and Philadelphia which made all roads impassable and stopped railroad travel for nearly a week.

Block-system. A system for the control of railroad trains so as to avoid collisions. Block stations are placed a few miles apart, connected by telegraph lines, and provided with signal boards or lights. The rule is that no train shall pass a block station while a train is on the section in advance, and until word comes back that the section is clear. Thus, if operated perfectly, there can be only one train on a section of three or four miles at a time, and collisions would be impossible. But men are not always to be trusted, and an automatic block system, in which the trains themselves work the signals, through electric attachments, is being introduced. The block system was first introduced in 1851, and is now much more common in Europe than in the United States.

Blow′pipe. A tube for blowing a jet of air into the flame of a lamp, a fire, or a gas-jet, in order to obtain a high temperature by rapid combustion. It is used in glass-blowing, in soldering metals, and in analytical chemistry and mineralogy.

Blue′bird. A small song-bird very common in spring in the United States. It lays five or six pale-blue eggs, and hatches several broods in a season.

Blue′fish. A large voracious fish, valued for food, and widely found on the American coast. It is called there the horse mackerel.

Bo′a Constrict′or. [L.] A large and powerful serpent of tropical America, sometimes twenty or thirty feet long. It has a succession of spots, alternately black and yellow, along the back. It kills its prey by winding it within its folds and crushing it by its muscular strength; but other serpents in Asia and Africa which crush their prey are also sometimes called by this name.

Bob'bin. [Fr.] A spool or reel, of bone or wood, with a head at one or both ends, and a hole bored through its length. It is used to hold yarn or thread in a shuttle, as in spinning or warping machines, looms, and sewing-machines. Bobbin lace is made on a pillow with bobbins.

Bod'y. [AS.] The material part of a living being. In the higher animals it is composed of a *head*, a central part or *trunk*, and four *limbs*. When the human body is dissected, or taken to pieces, there is found a hard part or skeleton, composed of about 240 bones; upon these bones lie masses of red flesh (muscles), by which the bones are moved; on the outside of all is a covering called the *skin*. The limbs are solid, but the trunk and head are hollow, containing certain organs, each of which has its allotted duty or function to perform so long as the body retains life. The muscles are called the organs of locomotion, because it is by their aid that we move about from place to place. The chief organ in the head is the *brain*, contained in the bony box called the skull. The trunk is divided, horizontally, into an upper portion (called the *chest*) and a lower portion (known as the *abdomen*). The organs within the chest are the *heart* and the *lungs*. In the abdomen are situated the *stomach*, the *intestines*, the *liver*, the *pancreas*, the *spleen*, and the *kidneys*.

Blow'ing-mach'ine. An apparatus to produce a blast of air. The blacksmith's bellows is one of the earliest forms of these. Various machine-blowers are now in use, which give a very powerful blast, some of them being rotary machines, others utilizing the steam jet to produce a blast. Another form of blower is the electric fan, with rotating vanes, used to keep the air in motion in stores or offices. Powerful fans are used for the melting of iron in cupolas, and air blasts are turned into smoke-stacks to make a powerful draft for locomotives, steam fire-engines, etc.

Boar. The wild form of the common hog. It is a large and strong beast, of four feet or more in length, while the male has dangerous canine teeth. It hides by day and roams at night, doing great damage to crops and young trees. It is hunted on this account, and also for its flesh and bristles, but often proves a dangerous enemy. In some parts of India "pig-sticking" is the favorite sport.

Bog. A tract of land covered with peat, which holds much water and converts it into a kind of quagmire. It is sometimes called Peat-bog, Peat-moss, or Moss, to distinguish it from other kinds of swamp. Bogs of wide extent occur in Northern lands and they cover a considerable part of Ireland. Some bogs are more than 40 feet in depth, and are dangerous to traverse in wet seasons. (See *Peat.*)

Boil'er. A vessel in which water is boiled to produce steam, for engine purposes. It is usually a large, cylindrical receptacle of iron, though boilers are frequently made of tubes, where rapid steam-making is desired. The boilers in use to warm buildings are commonly made of wrought iron, though copper is sometimes used.

Boom'erang. A peculiar missile used by the savages of Australia in war or the chase. It consists of a piece of hard wood of a bent form and about two feet long. One side is flat, the other convex in shape. When thrown it has a singular motion. Instead of going forward it rises with a whirling motion, then begins to go backward, and strikes the ground behind the thrower. The Australians are very skillful in the use of this singular weapon, and can make it strike where they wish.

Boil'ing. When water or any other liquid is heated in the open air, its temperature rises. After a time bubbles of vapor are formed and reach the surface, and at this stage boiling or ebullition has begun. The heat converts the water from the liquid state into the state of gas or vapor, which rises in bubbles and passes off into the air as steam. The temperature at which boiling begins is called the *boiling-point*. Different liquids have different boiling points,—that of water being 212° F.; of alcohol, 173.12°; of mercury, 662°; and of acetic acid, 243.14°. These are the temperatures needed at sea-level. At higher points, where the pressure of the atmosphere is less, the boiling point is reached at lower temperatures.

Bolt. [AS.] A strong pin of iron or other material used to hold something in its place, often having a head at one end and a screw thread cut on the other, on which a movable piece called a nut is screwed.

Bone. [AS.] A firm, hard substance, of a white

THE ULNA. THE HUMERUS. THE SCAPULA.

or pale rose color, composing the skeleton or firmer part of the body. There are 246 bones in the human body. They give shape and firmness

to the body, protect the organs from injury, and afford a solid place for the attachment of muscles. All bones are curiously fashioned, and beautifully adapted to their various purposes. Where the object is to protect, the bone is strong and thick, and offers the greatest resistance with the least material, or is so placed as to defend the organ. Those designed for support are thick and solid. Long bones are hollow, and contain marrow, which is composed chiefly of blood-vessels and fat. The other bones are spongy and lattice-like inside, and hard on the outside. Bones are full of fine tubes through which the blood passes. The bones of the various animals vary in their texture, and are chiefly composed of phosphate and carbonate of lime and gelatine. Bones are covered with a tough membrane, except at the joints, where they are covered with cartilage. When this cartilage is removed the bone dies. The bones of the trunk are the pelvis, spinal column (see *Backbone*), the ribs, the breast-bone, the shoulder-blade, and the collar-bone. The bones of the arms are the humerus, the ulna, and the radius. The wrist has eight bones and the palm of the hand five. The bones of the legs are the femur, patella, tibia, and fibula. The ankle has seven and the body of the foot five bones. The skull is composed of a number of bones, which surround and protect the brain (*q.v.*).

Bo′rax. A compound of boron with sodium and oxygen, is obtained chiefly from Tuscany, and is found also in Tibet, China, Nevada, and California. It is used in soldering gold and other metals, and in the arts as a flux. Dyers use it to give a gloss to silks. It is employed also in medicine, and as a cosmetic. It is valuable as an insecticide, being fatal to roaches, and is much used in preserving meat, fish, butter, and milk.

Bore. [Icel.] A tidal flood which rushes into certain rivers of peculiar configuration, and is dangerous to shipping, as at the mouth of the Amazon, the Hoogly, and the Tsien-tang; also the flow of the tide in the Bay of Fundy and in Hang-chow Bay.

Boul′der. [Dan. *buldre.*] A mass of rock chiefly rounded, that has been transported by the action of ice and other natural agencies from its native bed. *Boulder clay* is the unstratified clay deposit of the glacial or drift period, and often contains large numbers of boulders. (See *Glacier*.)

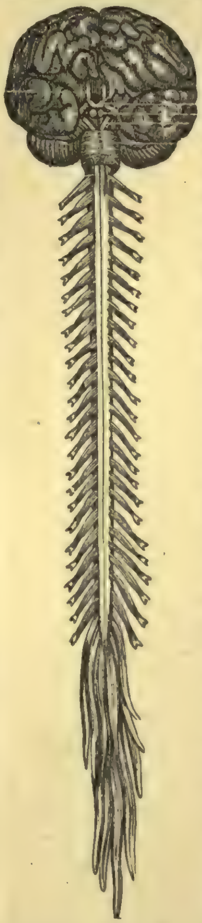
Bow. [AS.] Anything bent in the shape of a curve, as a rainbow. A weapon made of wood or elastic material, with a cord connecting the two ends, by means of which an arrow is propelled.

Box. [AS.] A tree or shrub which grows in various parts of the world. The common box has two varieties. The dwarf box is used as an edging for gardens. The wood of the tree kinds is hard and smooth. It is extensively used by turners, engravers, and mathematical-instrument makers. Also a wooden case or receptacle.

Brace. [Fr.] A cord, ligament, or rope for holding anything tightly. Any piece of matieral used to transmit or change the direction of a weight or pressure. In the plural, straps to sustain trousers.

Brad′awl. [AS.] A straight awl with chisel edge, used to make holes for brads, or thin nails with a slight projection at the top instead of a head.

Brain. [AS.] The brain is the principal nerve centre, and occupies the whole cavity of the head. It is carefully enclosed by membranes, its upper part being called the cerebrum, and its lower part the cerebellum. The interior mass of the brain is composed of white matter, but the entire surface has a thin gray covering. The surface of the cerebrum is made up of irregular rounded ridges or convolutions. The greater the number and depth of the convolutions, the greater the amount of brain surface, and the greater the amount of gray matter which covers the surface. It is supposed that the gray matter increases with study or thought. A deep indentation extending from front to back divides the brain into parts, so that in reality the brain is double, corresponding to the pairs of the external portions of the body. The two halves are connected by a central mass of fibres. From the nervous mass within the skull twelve pairs of cranial nerves extend to different parts of the head and face. From the brain the spinal cord extends downward through the spinal column to the lower extremity of the body. In every action which comes from thought, the mind, through the brain, with its outgoing nerves, directs the first steps, and the brain is regarded as the organ of intellect and the seat of the soul.



Brake. [AS.] A mechanism for retarding or stopping motion through friction by the pressure or rubbing against wheels, or of clogs or ratchets against a rail, or of a pivoted lever against a wheel or drum in a machine. An air-brake operates by compressed air contained in an iron box on the engine connecting with the wheels of railroad cars.

Bran′dy. [Ger. *branntwein.*] A strong alcoholic liquor, distilled chiefly in France from wine. When wine is heated in a close vessel, the alcohol arises out of it as vapor. If the vapor be

made to pass through a tube surrounded by cold water, the alcohol will be condensed to a liquid, which is brandy.

Brass. [AS.] An alloy of two parts of copper and one of zinc. Prince Rupert's metal, used in jewelry, has from 75 to 80 per cent. of copper. The alloy used in Dutch metal has 85 per cent. of copper. It is much used for machinery, telescopes, buttons, screws, etc.

Brazil-nut. The fruit of a large tree, found on the Orinoco River, South America. The nuts, which are known commonly as Cream Nuts, are three-sided, with hard shells, and white meat which is very good when fresh, but soon spoils from its abundance of oil. The nuts are packed in a smooth round case, half as large as a man's head, twenty or thirty of them in one case. They fall when ripe, rendering it dangerous to pass under the tree at that time. The monkeys are very fond of them, fighting for the nuts and throwing down the cases to break them.

Brazil-wood. A red dye-wood, brought from Brazil, and used in dyeing silks, the dye being got from the wood by boiling. Brazil got its name from this wood, which the Portuguese called *braza*, or glowing embers, from its red color.

Bread. [AS.] An important article of food made from the flour of wheat or other grains. In the process of bread-making from 50 to 60 per cent.

BREAD-FRUIT.

of water is added to the flour, in which yeast or other leavening matter is mixed. The yeast causes the dough to ferment, in which process the starch of the flour gives off carbonic acid gas. This forces the dough to swell, and fills it with a great number of air cavities, making it what is called light. The dough is then divided into loaves, and again left to stand, and again it swells. The loaves are then put into the oven, when the moisture evaporates and they swell, while a yellow crust begins to form on the surface. They are baked in the oven till the bottom crust is hard. The acid is driven out of the dough by the heat of the oven. Aerated bread was invented by Dr. Dauglish of Malvern. It has no leaven, but has carbonic acid gas forced into the dough by machinery. The mixture and kneading are also done by machinery. (See *Biscuit.*)

Bread-fruit Tree. A native of the South Sea Islands which bears a large, nearly round fruit, the size of a child's head. The pulp, when not quite ripe, is white and mealy, and is baked for food. It has little taste, but is very nutritious. The tree has been introduced into the West Indies and South America.

Break′water. A bank of stones or a structure of timber, built to break the violence of the sea before its entrance into a roadstead or harbor. A great quantity of large stones are usually sunk, and the bank which they form is built upon with large blocks of artificial stone. In some localities breakwaters of immense size and extent have been built.

Breath′ing. The act of respiration. The organs concerned in breathing are the nostrils, the wind-pipe and the lungs. The wind-pipe is a stout tube, divided below into two tubes, one of which goes to the right and the other to the left lung. When the ribs are elevated and the diaphragm is depressed, there is a tendency to produce a vacuum between the lungs and the wall-chest. The air forces its way into the air-passages of the lungs, and expands the lung tissue so that it fills the enlarged space within the chest. This is inspiration. When the ribs and diaphragm return to their passive condition, the pressure of the air ceases, and the elastic tissue contracts, forcing

AIR-CELLS AND CAPILLARIES OF A HUMAN LUNG (MAGNIFIED).

the air out. This is called expiration, and the whole act respiration. At every inspiration we draw into the lungs rather more than half a pint of cool, fresh air. At every expiration we send out the same quantity of hot, foul air. Air that has been breathed once is found to have lost about one-twentieth of its oxygen, and to have gained as much carbonic acid gas. Such air is not fit to be breathed again. While we are in the open air there is little fear of our being compelled to breathe the same air twice ; but in

rooms it is necessary to see that there are openings for the impure air to pass out, and other openings to allow fresh air to get in. If we reckon that we breathe fifteen times per minute, it can be readily calculated that an ordinary adult takes into his body from the air, by means of his lungs, 1½ lbs. of oxygen daily, and gives to the air a rather greater amount of carbonic acid gas. The frog has no ribs, but simply closes its lips and swallows the air which is in its mouth. Turtles swallow the air in the same way as frogs. Fishes get all the air they need from the water, which enters freely at the mouth and passes over the gills, and escapes at the gill slit—the oxygen from the water being absorbed by the blood of the gills. A fish out of water dies for want of oxygen, which it can take from water but cannot take from air, and so it is suffocated by air. Lobsters breathe only by gills, which are situated in a cavity under the body and attached to the legs, the action of the legs and of a spoon-shaped appendage causing a current of water to pass over the gills, which absorb the needed oxygen. Insects breathe by air-tubes that pass through every part of their body, and open on the surface of the body in small holes, which exclude water or dust, but admit air. (See *Lungs.*)

Brick. [Fr.] A mass of clay which is converted into building material by burning. The clay is dug up, exposed to the air and frost, and kneaded or mixed with water until it is a thick paste, and then moulded into bricks, which are called green or raw bricks. A brick-making machine will turn out from twenty to thirty thousand green bricks a day. These are burned in large ovens or kilns. The color of bricks depends on the proportion of iron they contain; red bricks have much iron, and cream bricks have little iron in them. Terra-cotta is a very fine clay of a delicate red color, made into bricks, urns, and statues. Bricks are used for buildings of all kinds, and are cemented by mortar made of sand and lime.

Bridge. [AS.] A roadway over a stream, valley,

or low ground. *Viaduct* is applied to bridges over which a road or railway passes; and *aqueduct* is applied to those for carrying a canal or water. They are made of wood, stone, iron, or steel. Bridges are built in various ways. In shallow water they are supported from the bottom, or stone piers are built, and arches thrown from pier to pier. Suspension bridges are held up by strong strands of wire stretched from shore to shore. A common way of building bridges now is by truss or girder work, the bridge being sustained by iron girders firmly bolted together. There are many remarkable bridges in existence, some of them of great length and width and able to support immense weights.

Britan′nia Met′al. [From L. *Britannia*, Great Britain.] An alloy of tin, antimony, and copper. It varies in composition, but in general it contains from 80 to 90 per cent. of tin, with varying proportions of the other two metals. It is used for the manufacture of numerous articles for the table, also as a basis for electro-plating.

Bronze. [Fr.] An alloy of copper and tin, with a small quantity of zinc added. Bronze is used for statues, ornaments, bells, cannon, coin, etc. Turkish gongs and cymbals are made of a bell-metal plunged while hot into cold water. Hard bronze is obtained from 7 of copper to 1 of tin; while soft bronze, which bears rolling and drawing, contains 16 of copper to 1 of tin. Bronze for bells generally contains a little zinc and lead. Copper with 10 per cent. of aluminium yields a handsome golden yellow alloy, known as *aluminium bronze*, and much in use for various purposes.

Broom. [AS.] A low shrub with long, straight, green angular branches, minute leaves, and yellow flowers. The twigs, when tied together, are suitable for making brooms to sweep with.

Brussels-sprouts. A plant of the Cabbage family, which produces in the axils of the upright stems numerous small green heads or *sprouts*, each a cabbage in miniature.

Buck′wheat. [*Buck*, a beech tree; and *wheat.*] A plant of a family which includes knot-weed, called also Saracen wheat, with a triangular seed shaped like beech-nuts; when ground it is used in America for griddle cakes, in France for bread or as gruel. In England it is sown as food for pheasants, to decoy them from their covers. Its flowers yield excellent honey, of which bees are very fond, and it is often planted in the United States for this purpose.

Bud. [AS.] The rudiment of a branch, a leaf, or a flower. In biennial and perennial plants buds are formed towards the close of the growing season in the axils of the leaves. Terminal buds are those at the end of branches, and lateral buds are those at the sides. Buds are usually protected from the frost during winter by a covering of scales. The buds of plants growing in tropical countries have no special covering.

Buf′falo. [Span.] A ruminant animal of the Ox family, found in Southern Asia and Europe and in South Africa. The buffalo of Asia is a native

of the East Indies, but has been introduced into other countries as far west as Italy. This animal is fond of water, and during the heat of the day lies in water sunk up to its nostrils. It covers itself with a coating of mud, as a protection against insects. It has long been domesticated and used as a beast of burden, and is the farming animal in the Phillipine Islands. The Cape buffalo inhabits South Africa, and is regarded by hunters as very fierce. Its horns are very broad at the base. Buffalo-horn is used for combs, drinking-cups, and knife and fork-handles. The American bison is generally called buffalo. (See *Bison.*)

Bug. [Celt.] A general name applied to various insects, as squash-bug; but specially also the bed-bug. Also, loosely, any beetle, such as lady-bug, potato-bug, etc.

Bu′gle. [Fr.] A copper musical instrument for calling hounds or for summoning soldiers, first made from the horn of a wild ox. In bands the bugle is now superseded by the cornet.

Bull′finch. A European cage bird allied to the grossbeak, with the breast and neck red, It may be easily taught to whistle correctly musical airs

THE COMMON FROG

Bull′frog. The largest of the frogs, it being generally 6 to 8 inches long, and 4 inches broad. It is very common in the United States, especially in the South, and derives its name from its loud call, which resembles the lowing of a bull.

Bun′ion. [Fr.] A swelling usually on the first joint of the great toe, caused by continued pressure of tight boots.

Bun′sen Burn′er. This burner consists of an ordinary gas-jet over which is placed a metal tube about 5 inches long, perforated with holes at the bottom. When the gas is lighted, air is drawn through the holes, and mixes with the gas before ignition. From this air a plentiful supply of oxygen is obtained to allow complete combustion to proceed at once throughout the whole flame, and thus a smokeless, non-luminous flame of great heating power is obtained. The burner is used for various purposes, such as fire-lighting, cooking, ironing, heating, and soldering.

Buoy. [Du. *boie*, a chain.] A floating mark or beacon to point out a shoal or danger, usually chained to its place. Life buoy, a float intended to keep from sinking. Bell-buoy, a buoy with bells rung by the waves.

Bur′dock. A rough wild plant, very common in Europe and the United States. It is about a yard high, has large coarse leaves and purplish flowers, and bears prickly seed burs, which catch on clothing, the wool of sheep, etc., and are thus scattered. The leaves and their juice are of use in healing burns or the itching effect of poison ivy.

Bush′el. [Fr.] A measure of capacity of 4 pecks or 8 gallons or 32 quarts. The English imperial bushel contains 80 lbs. of water at 62° F. The United States bushel contains 77.6274 lbs. of water at 39.8° F.

Bust′ard. A bird, native to Europe and Asia, where it inhabits dry open plains. It has large wings, but rises in the air only at times. When on the wing, its flight is strong and sustained. It generally runs along the ground, and feeds on vegetable matter, worms, and insects. The Great Bustard has a long neck and longer legs, measures about 2 feet 6 inches in length, and weighs about 20 lbs. The Little Bustard is about half this size.

But′ter, [AS.] A fat contained in milk, and obtained from the cream by churning. The cream is beaten about in the churn until the skin of curd which exists around every little ball or globule of fat is broken; the particles of fat then stick together and form butter. The butter is then well washed in fresh water, to remove the small pieces of curd. A little salt is mixed with fresh butter; but if the butter is to be kept for a long time, much more salt must be used. Like all fats, butter is almost entirely a heat-giving and force-producing food.

But′tercup. [AS.] A kind of crowfoot with bright-yellow flower. It is the cuckoo-bud of Shakespeare. (See *Flower.*)

But′terfly. The most beautiful of insects, having wings covered with colored dust, which is really fine, shiny, iridescent scales. The butterfly is therefore called a scale-winged insect. Young caterpillars are hatched from the eggs of the butterfly. In some cases these eggs are beautiful, shaped like vases and caskets. They are fastened to leaves, and the mother, during her brief life, seeks to deposit them on that plant which, after the caterpillars are hatched, will afford the proper food. The eggs of butterflies lie dormant during the winter, because the cold of winter would be fatal to the young insects. and the leafless trees would afford the caterpillars no food; but the warmth of the spring soon develops the living embryo. The caterpillar is composed of thirteen rings joined together, and has six jointed legs on three of the rings behind its head, like the six legs of its mother. These remain with it through life, while the four pairs of legs on the rear part of its body disappear. The caterpillar crawls over the plant upon which it was born, devouring the green leaves. During this stage it is called a larva. After a time it ceases to eat, and becomes a pupa or chrysalis. Under its chin is a little spinner, from which issues a silken thread, with which it suspends itself, head downwards. Others hang from the tail. The chrysalis remains as if dead, but is really feeding on the fat formed in the body of the larva; and in due time the *imago*, the perfect butterfly, comes forth, dries its wings, and flies away full grown. Butterflies fly in the daytime, and when they

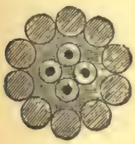
rest their wings are raised over their back. The antennæ stretch out nearly straight, and end in knobs. The under side of the wings often resembles in color the flower upon which the butterfly feeds. Conspicuous are the large round eyes, which under the microscope are found covered with numerous flat surfaces. These are called compound eyes, for they consist of a great number of eyes crowded into a mass. There are about five thousand kinds of butterflies. They are great rovers, and having no homes they flit about among the most brilliant but shallow blossoms' perfecting their seeds.

Buz′zard, [Fr.] A bird of the Falcon family. There are various kinds of this bird of prey—the common buzzard, the rough-legged buzzard, the honey buzzard, the moor buzzard, the bald buzzard or osprey, the carrion buzzard· and others.

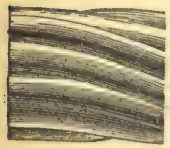
C

Cab′bage. [O.E., or L. *caput.*] An esculent vegetable with a foot-stalk, short, strong, and fleshy, which runs as a great rib to the point of the blade, while smaller ribs run from it to the edges. The common cabbage has a compact *head* of leaves, hence its name. It is one of the most nutritious of ordinary vegetables. Red cabbage is used as a pickle. In the Channel Islands, a tree-cabbage four feet high is grown to feed cattle.

Cab′inet. [Fr.] A safe place for jewels or paper; usually a set of drawers or a cupboard closed with doors. *Cabinet.* A private room in which consultations are held. Monarchs formerly consulted with their councillors in cabinets, hence the name became applied to the board of councillors. In the United States it is applied to the heads of the government departments who act as adviser of the President.



Ca′ble. [Fr.] A strong chain or rope for fastenings ships or other purposes. Telegraph cable is a rope of gutta-percha, yarn, and iron wire, in the centre of which are copper conducting wires to be laid underground or under the sea. The largest chain cable, with links 2⅞ inches thick, was made especially for the steamship *Great Eastern.*



A CABLE.

Cac′tus. [L.] A kind of plant like the prickly pear, found in tropical America, usually with leafless stems and branches, and sometimes clustered thorns. (See *Cochineal.*)

Cad′dy, [E. Ind.; from Malay, *kati*, a weight of 1½ lbs.] A small box for holding tea.

Caffe′in. [Fr.] A white, bitter, crystallizable substance obtained from coffee.

Cais′son. [Fr.] An apparatus used in laying the foundation of bridges under water. One form is an inverted water-tight hollow box with iron-bound edges, in the bottom of which some masonry has been constructed. The weight of the masonry forces the caisson into the sand and mud at the bottom, and air, under pressure, is then forced in, driving out the water and allowing the workmen to enter through the air-tight locks.

Cake. [Scand., or L. *coquere*, to cook.] A mass of dough, made palatable by the addition of sugar, eggs, fruit, and other materials, and baked in the oven; or made into a batter and baked on a griddle. It differs in these respects from bread. Also the compressed seeds of flax, rape, and cotton. These contain much oil, which is extracted by strong pressure, leaving a compact cake of about half an inch in thickness. Oil cake is used as food for animals, half-a-pound a day being sufficient for a sheep and five pounds for a bullock. It is used in addition to grass, hay, or other food.

Cal′abash. [Span.] A tree found in tropical America, the gourd-like fruit of which has a soft pulp, and its shell is made into drinking-cups and bottles.

Cal′amus. [L. *Acorus calamus.*] The Sweet-Flag, a plant found in ditches and by the side of ponds in Asia, Europe, and North America. The root-stock yields an aromatic stimulant and tonic, much used as a medicine in the East. It is also made into confections and used in liquors in Germany. Some persons chew it to clear the voice and sweeten the breath.

Cal′cium. One of the metallic elements, whose oxide is the abundant and very useful lime. It occurs abundantly as limestone, and in its crystallized form as marble. Calcium carbonate is so abundant in nature that it is found in most natural waters, in which it is dissolved and carried to the sea. Sulphate of lime is a common constituent in what is known as *hard* water, and is found in sea water. In its solid state it is known as Gypsum, or Plaster of Paris.

Cal′culating Machine. An instrument in which, by the movement of keys, acting upon an intricate mechanism, arithmetical calculations may be made. The Babbage machine was capable of performing remarkable operations, but was of no practical use. There are simpler instruments now in use which add, subtract, multiply, and divide with wonderful speed and accuracy.

Calf. [AS.] The young of the cow and of some animals; also leather for bookbinding made from calf-skin. The flesh of calves is called veal. Calf-foot jelly is the gelatine of the feet of the calf, extracted by boiling and flavored with sugar or essences.

Cal′ico. [E. Ind.] Fine white cotton cloth, with special names, as super calicoes, shirting calicoes, unbleached calicoes. Also cotton (*q.v.*) cloth with a figured pattern.

Cal′ipers. A kind of compasses with curved legs for measuring the diameter of round bodies.

Cal′omel. [Gk.] A compound of chlorine and mercury, which is found native as horn quicksilver in Bavaria, Bohemia, and Spain. It is of great value in medicine, being one of the mildest and most frequently used of all the preparations of mercury. It is used for the liver, as an ointment, and in producing salivation.

Calor′ic Engine. A form of air engine, invented by John Ericsson, which is in considerable use for light machinery. In its working parts it resembles the steam engine, but is operated by the expansive power of hot air instead of steam.

Cal′yx. [Gk.] The outer covering of a flower. It is usually green and leafy, but in such flowers as the anemone is delicate and resembles the petals. Each leaf of the calyx is a sepal. (See *Flower*.)

Cam. [Dan.] A turning or sliding piece of machinery, which, by the side of its face or a groove on its surface, changes the motion of another piece against which it acts. Cams are used in the pin-machine, the sewing-machine, and others where varied motion is required.

Cam′bric. A kind of fine thin white linen, first made at Cambray in Flanders. Cambric muslin is thin white cotton.

Cam′el. [L. *camelus*.] A most useful ruminating animal, which for centuries has been used as a beast of burden or ship of the desert on the sandy plains of Africa and Arabia. It is well adapted by nature for life on the desert. It can go for many days without water, being provided with a remarkable arrangement of cells in its stomach or paunch which

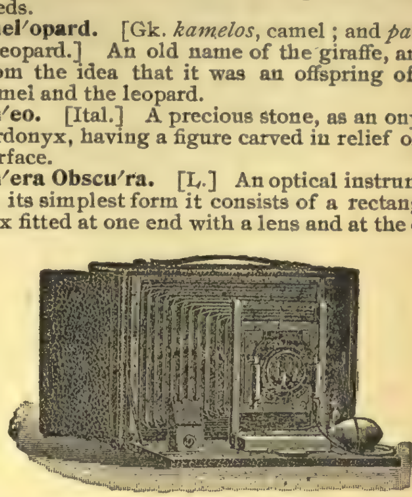
it fills with water, and keeps as a store for future use. Its two long toes rest on a broad, horny cushion, which enables it to walk without sinking in the sand, and its nostrils can be closed at will to shut out the fine dust of the sand-storms. The African or Arabian camel has one hump, and is called the dromedary. The Bactrian camel of Central Asia has two humps. The hump is not a part of the skeleton, but is a mass of fat which slowly lessens when the animal is on long journeys and food is scarce, it being consumed as nutriment. The camel is about six feet in height, and not very rapid in speed. It is very useful to the Arab, conveying himself and his belongings on a journey, and yielding him flesh and milk for food, hair for weaving into a covering, and hides for sandals and saddles. Camel hair is used for painters' brushes.

Camel′lia. [Probably named after Kamel, a Jesuit, who first brought the plant from the East.] An Asiatic shrub with shining green leaves and showy flowers. In China oil is pressed from its seeds.

Camel′opard. [Gk. *kamelos*, camel; and *pardos*, a leopard.] An old name of the giraffe, arising from the idea that it was an offspring of the camel and the leopard.

Cam′eo. [Ital.] A precious stone, as an onyx or sardonyx, having a figure carved in relief on the surface.

Cam′era Obscu′ra. [L.] An optical instrument. In its simplest form it consists of a rectangular box fitted at one end with a lens and at the other



end with a plane mirror, inclined at an angle of 45° to the horizon. When the lens is directed to any object, the rays of light, after passing through the lens, are reflected from the mirror, and form an image on a plate of glass at the top of the box, where they may be observed and sketched. Instead of the box it is usual to have a kind of tent surrounded with curtains to keep out the light. There are various forms of the *camera* now in use for taking photographic negatives, the photographic camera being an adaptation of the camera obscura, which is fitted at the back for the introduction of a sensitized plate or film, so as to receive the image of an object or scene in front of the lens.

Cam′omile. [Gk. *chamai*, on the ground; and *melon*, an apple.] A bitter herb used as a medicine. Its flowers have a strong and fragrant smell, with an aromatic taste. Its volatile oil is used as a carminative.

Cam′phor. A white resinous substance existing in many plants, but mainly obtained from the camphor laurel, grown in China, Formosa, and Japan. The Borneo or Sumatra camphor, highly esteemed in China, is obtained from a lime tree in Sumatra, Borneo, and the Malay Peninsula. Camphor has an aromatic odor and a strong, unpleasant taste, and is soluble in alcohol and oil. Spirits of camphor is camphor dissolved in spirit. When this solution is poured into water, the camphor reappears in white flakes. Camphor is used as a medicine, and enters largely into varnishes used by painters. It is also used to kill moths and other insects among furs or woolen cloths. For a further important use of it see *Celluoid*.

Canal′. [L. *canalis*, a pipe.] A waterway made for boats or ships or for irrigation. The barrier which confines the water is called the weir or guard-lock, and the enclosure with gates at each end to raise or lower boats as they pass from one level to

another is called the lift-lock. Most famous among canals is the Suez Canal, which was opened November 17, 1869. It is 87 miles long—66 miles actual canal and 21 miles lake—connecting the Mediterranean and the Red Seas. An effort to connect the Atlantic and the Pacific Oceans by a canal across the Isthmus of Panama has been made, but as yet without success, and it is proposed to make a similar canal across Nicaragua by the United States government. There are thousands of miles of canals in Europe and America.

Cana′ry. A cage bird about the size of a sparrow, which is found wild in the Madeira and the Canary Islands. Great quantities of tame birds are raised in Germany. In its wild state it is generally of a dusky gray color; but tame birds are of very many different colors, those with white or yellow feathers being most valued. The tame bird is a sweet singer, some having the skylark, others the woodlark, and others the nightingale note. It is the favorite among cage birds.

Can′dle. [L. *candela*, a (white) light made of wax or tallow; from *candere*, to be white.] A twist of threads surrounded by tallow or wax which gives light when lit. Common candles are made of *tallow*. Lumps of fat from sheep or cattle are first melted in large pans, and then boiled with water. From the fat or tallow so obtained we can make the candles called "dips," by dipping skeins of cotton (wicks) into the melted tallow. The candles called "moulds" are made by running the tallow into metal tubes, the wick having been first stretched down the middle of the tube. *Wax candles* are made from the wax produced by bees. *Stearin candles* are made from a hard kind of fat called stearin, which can be extracted from tallow. *Composite candles* consist of a mixture of tallow and stearin. *Paraffin candles* are made of solid paraffin, which, like paraffin oil, is prepared from a mineral substance that oozes out of or can be obtained by heating certain rocks called bituminous shales. (See *Smelt*.)

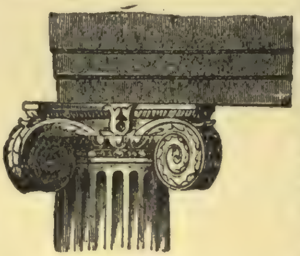
SUGAR CANE.

Cane Sugar. The variety of sugar obtained from the sugar-cane and the sugar-beet, as distinguished from *grape-sugar*, which is obtained from maize and some other plants. (See *Sugar*.)

Can′ister. [L. *canistrum*.] A basket of reeds, or a small box for holding tea or coffee.—*Canister shot*, or case shot, a kind of shot with a number of lead or iron balls enclosed in a case which bursts when fired.

Can′nel Coal. A hard, jet-black variety of coal which burns with a bright white flame. The gas yielded by this coal has nearly three times the illuminating power of that obtained from common coal. It is hard enough to be cut and polished like jet, and is sometimes made into trinkets. In Scotland it is known as parrot coal.

Can′non. [Fr. *canon*; from L. *canna*, reed, pipe, tube.] A piece of ordnance or artillery. The large cannon now in use consists of a forged steel tube strengthened with massive steel rings shrunk upon it. Howitzers and mortars are sometimes called cannon. Cannon are distinguished by the weight of the ball, or the diameter of their bore. Some of the great rifled guns now in use can send a heavy ball a distance of 10 or 12 miles.



CAPITAL.

Canoe′. [Span. *canoa*.] A boat made of the trunk of a tree hollowed, or of bark or skins. It is propelled by a paddle or sails, and has no rudder.

Can′teen. [F. *cantine*, bottle case.] A refreshment house in a fort or barracks for the use of soldiers, where they can purchase food and other necessaries, and intoxicating liquors under certain restrictions. A vessel, usually of tin, used by soldiers, in carrying water or other liquids.

Can′vas. [Fr. from Gk. *kannabis*, hemp.] A coarse cloth for sieves, sails, and sacks, made from hemp, flax, or cotton; the cloth on which a picture is painted.

Caout′chouc. [Ind. pronounced *koo′chook*.] The elastic gum of several trees in South America, Africa, and Asia. It is impervious to liquids and gases, and is much used in the arts and manufactures. (See *India-rubber*.)

Capercail′zie. [Celt.] A kind of large grouse with a fine flavor found in Scotland and in Northern Europe, especially Norway and Sweden, and known under the name "cock of the woods."

Cap′illary. [L. *capillus*, a hair.] A tube with a hair-like bore; a minute blood-vessel.

Cap′illary Force. The force by which water ascends in wood, sponge, blotting-paper, and other porous bodies. By the same action the flame of a lamp is fed with oil. The wick is a bundle of threads whose surfaces are nearly in contact, and the oil rises between them in the same way as if they were narrow tubes. Water is supposed to rise from reservoirs and springs below the surface of the ground to the roots of plants in the same way as it rises in fine tubes.

Capillary action seems to be due to an attraction between water and the surfaces of solid substances.

Cap′ital. [Fr.] The head of a column, and consisting of abacus, bell, and necking. The Greeks used three orders—Doric, Ionic, and Corinthian. The Romans added Tuscan and Composite. Other orders in use are Byzantine, Moorish, and Gothic. Also the seat of government of a state or a nation. *Capital letters*, heading letters, used at the beginning of sentences, etc.

Cap′itol. Originally the great national temple of Rome. A modern Capitol now stands on its site. The name has been applied to the building in which the United States Congress holds its sessions; also to the legislative halls of the States.

Cap′stan. [Fr.] A vertical drum revolving on an upright spindle with a drum-head, in which are sockets for bars or levers. It is used on board ship to raise weights by means of a rope, and is worked either by steam power or by men walking round pushing on levers in the sockets.

Cap′sule. [L. *capsa*, a chest.] A seed-vessel of a plant containing many parts or carpels, as the flax, the poppy, and the lily; a metallic seal or cover for closing a bottle; also in medicine a gelatinous envelope in which bitter doses are enclosed.

Car. [Fr.] A frame on wheels for carrying persons or loads. In the United States the word is applied to vehicles used on railroads or for street travel. Railroad cars are called *carriages* in England, except Pullman cars, train cars, etc., introduced from America.

Car′at. [Fr.] A weight of 3⅙ grains Troy, divided into four parts or carat grains, for weighing gold, diamonds, or precious stones; the twenty-fourth part of any quantity of pure gold. Goldsmiths' standard is 22 carats, which consists of 22 parts of gold, 1 of copper, and 1 of silver.

Car′avan. [Per. *karwan.*] A company of merchants, pilgrims, or travelers, joined together for mutual safety and protection, in Asia and Northern Africa, with camels as the usual means of conveyance. A large covered carriage for conveying passengers or wild beasts or furniture. Shortened into *van.*

Car′away. [Bot. name *Carum carvi.*] The seed of a plant like a carrot, of the Parsley order, grown in Holland; used in confectionery and as a carminative.

Carbide of Calcium. A product of the electric furnace, consisting in a compound of calcium and carbon. It is of interest from the fact that when met it yields in abundance acetylene gas, remarkable for its illuminating powers.

Carbol′ic Acid. An organic compound derived from coal-tar. When pure it is a white crystalline substance, possessing a burning taste and the odor of creosote. In the crude form it is largely used as a disinfectant. It is also applied externally to wounds and abscesses after they have been opened. Taken internally, it acts as an irritant poison, but in small quantities it is used as a medicine. Drains and sewers are sometimes flushed with solution of carbolic acid in order to remove infectious matter.

Car′bon. A non-metallic element known only in the solid form and very widely distributed. It enters into the composition of all organic structures, whether animal or vegetable. It is found in all the animal tissues, and, with oxygen, hydrogen, nitrogen, and sulphur, makes up the whole plant—wood, leaves, and flowers. All vegetable products—such as sugar, starch, gum-arabic, alcohol, oils—consist largely of carbon combined with oxygen and hydrogen. Carbon is the chief constituent of coal; and coal, when heated so as to expel its gases, is turned into coke, which is also carbon. Carbon is also found under the form of what is often named blacklead, but which is properly called plumbago or graphite. This is the substance from which pencils are made. The diamond, though widely different in appearance from all the other forms, is pure carbon.

Carbon′ic Acid. One of the products of the combustion of carbon, also known as carbon dioxide. When coal or wood burns brightly in the fire, carbonic acid is produced, and it may be prepared artificially by acting on chalk or marble with hydrochloric acid. The air we breathe contains oxygen, which enters the blood, combines with the waste carbon of the tissues, and is breathed out again as carbonic acid. This substance is given out in large quantities from volcanoes, and from the ground in volcanic regions. It is also produced during the fermentation of wine and beer. It is one of the permanent gases of the atmosphere, in the proportion of about 4 volumes in 10,000. Plants derive it from the atmosphere and supply it to animals.

Carbonif′erous Sys′tem. In geology the system of Primary rocks overlying the Devonian. It takes its name from the extensive coal-beds which it contains. In the system there are two well-marked sub-divisions—the lower section consisting of carboniferous limestone, and the upper, of the coal-bearing division of the system known as the coal-measures. These comprise sandstones, dark shales, and seams of coal. The flora of the Carboniferous period consisted almost entirely of flowerless plants, such as ferns; and among the fauna, fossils of true air-breathing animals and various insects are found. The system is very largely developed in the the United States. (See *Coal.*)

Carborun′dum. A compound of carbon and silicon, produced in the electric furnace. It was discovered in 1890 in an effort to make artificial diamonds, in which bright blue crystals hard enough to cut precious stones were formed. When powdered it is superior as an abrasive to emery and even to diamond dust. It is now largely produced at Niagara Falls, and widely used as a sharpening agent.

Car′buncle. [L. *carbunculus*, a small coal.] A precious stone of a fiery-red color, found in the East Indies—a ruby, sapphire, or garnet. A hard

and painful swelling on the skin on the trunk or back of the neck, larger than a boil, and with no central core.

Card. [L. *carduus*, a thistle.] A comb with bent wire teeth set in leather to smooth and arrange the fibres of cotton, flax, wool.

Car′dinal Bird. An American song-bird or finch, with bright-red feathers and a high-pointed crest.

Ca′ret. [L. *carere*, to want.] A mark (∧) on a line of print or writing to show that something wanting and interlined or on the margin ought to be inserted.

Car′mine. [Fr. *carmin.*] A rich red or crimson color with a purple shade, prepared from cochineal, and having acid properties.

Carp. [Dan.] A fresh-water fish, originally from Asia, but now in Europe, reared in artificial ponds, and latterly also introduced into America. The leather carp is almost wanting in scales, and the mirror carp has only a few large scales.

Car′pentry. [L. *carpentum*, a coach.] A work in wood for the construction of buildings. A carpenter frames and puts together roofs, partitions, and floors of buildings; a joiner makes the doors, shutters, stairs, mantle-pieces, and other parts requiring more neat joining.

Car′pet. [Fr. *carpette.*] A thick covering or the floor, usually of wool, but also of cotton, hemp, and straw, and made in breadths to be sewed together and nailed on the floor. Brussels carpet is made of worsted yarn on a foundation web of strong linen thread, the worsted being drawn up in loops to show the pattern. Kidderminster carpet is an ingrain carpeting chiefly made at Kidderminster, England. Tapestry somewhat resembles Brussels, the warp being printed at intervals before weaving, so as to produce the figure in the carpet. Turkish carpets and Persian carpets are made similarly with woolen threads on a linen warp, and are similar in color and in softness. Axminster carpets are like Turkish, but are made with worsted, and are very handsome. Moquette, Chenille, and Wilton are velvety carpets.

Car′riage. Motor. (See *Automobile.*)

Car′rier-pig′eon. A variety of domestic pigeon used to convey letters from a distant point to its home. It has been used in war.

Car′ronade. [From Carron in Scotland, where first made during the Peninsular War.] A short cannon without trunnions, but supported on its carriage by a bolt.

Car′rot. [Bot. name *Daucus carota.*] A biennial plant with a long tapering spindle-shaped root of a red color. It is used in soups and stews, and highly valued as a food for cattle.

Cart. [Celt.] A frame on two or more wheels for carrying loads. In excavating sand, gravel or earth, one-third cubic yard of material before it is loosened is a cart-load.

Car′tridge. [Fr. *cartouche.*] A case of paper or metal containing powder and sometimes shot for a gun. Ball cartridge contains a projectile, and blank cartridge is without one.

Ca′sein. [L. *cāseus*, cheese.] An albuminous substance contained in milk, and forming the principal constituent of cheese. The casein in milk is not coagulated by boiling, like albumen; but *rennet*, or an acid, separates out the casein and butter as *curds*, leaving the milk, sugar, and salts as *whey*.

Cas′sia. [Semitic.] The pulp of the pods of a leguminous shrub in the East Indies; also the bark of Chinese cinnamon, imported as cassia and sold as cinnamon, from which oil of cinnamon is extracted.

Cast-I′ron. Iron that is cast into pigs or moulds. It contains more carbon than steel, is brittle in character, but is used for many purposes. (See *Iron.*)

Cas′tor Oil. A mild cathartic oil got from the castor-oil plant (*Ricinus communis*), and used as a medicine. It is colorless, but possesses a nauseous taste. In India it is obtained in such abundance as to be used for illuminating as well as for medicinal purposes. It is greatly made in France, Italy, and the Western States of America.

Cat. [L. *catus.*] A small domestic animal, of the same family as the lion, tiger, leopard, etc. The cat is a flesh-eater, and is fond of birds and mice. It has a fur coat, smooth and glossy and soft as silk; has padded feet, can run or walk noiselessly and is a good climber. The cat seeks its prey at night, having excellent powers of vision, while the long stiff hairs around its mouth are very sensitive, and aid it to find its way in the dark. There are several varieties of cats, as the Angora, Manx, Maltese, Persian, and tortoise-shell. The Persian has long, soft, silvery hair and bushy tail. The Manx cat has no tail. Wild cats feed on birds, rabbits, hares and poultry.

CATERPILLAR.

Cat′acombs. [Gk. *kata*, downward; *kymbe*, cavity.] Great excavations in the vicinity of ancient Rome, used for burial by the early Christians. They are cut in a soft volcanic material, and the total length of their galleries is at least 300 or 400 miles.

Cat′bird. An American bird allied to the Mocking-bird, and possessing a remarkable power of imitating the notes of other birds. Its spring song is mellow and sweet, but it has also a disagreeable note, somewhat like the mew of a cat. It is found in the eastern half of the United States.

Cat′erpillar. [Fr.] The larval state of a butterfly or moth. True caterpillars have three pairs of true legs and several pairs of fleshy legs armed with hooks. They usually feed on leaves, fruit, and vegetables. Some are called worms—as silk-worm, canker-worm, etc. After a time they surround themselves with a sheath or case of leaves, silk, or other substance, pass into the chrysalis state, and finally emerge as the mature insect. (See *Butterfly*.)

Cat′fish. A common American fish, with naked skin and eight fleshy barbules on the head. It is from 7 to 9 inches long, and is a favorite food-fish. The Great Lake Catfish, found in Lakes Erie and Ontario, is from 2 to 4 feet long, and weighs from 6 to 30 pounds. There are also very large catfish in the Mississippi and other rivers of the West.

Cat′gut. A cord of great toughness made from the intestines of animals, especially of sheep, and used for musical instruments.

Cat′kin [O.E.] The flowers of willow, poplar, and some other trees. It consists of a slender axis with many flowers wanting in petals along its sides, and is called catkin from its resemblance to a cat's tail.

Cat′nip or **Cat′mint.** [L. *Mentha cataria.*] A plant common in the United States, of whose leaves cats are very fond. They have a sharp and bitter taste. A tea made from them is sometimes used as medicine.

Cats′eye. A very precious stone which, when cut in a certain way, presents different colors, like the opal. It is so named because the eye of the cat has a similar power.

Cattle. A term denoting all animals of the ox kind. [See *Cow*.]

Cau′liflower. [Fr.] A variety of cabbage with a cluster of flower stalks and buds. It is more delicate in taste than the ordinary cabbages, and much esteemed as food.

Caus′tic. [Fr. from Gk. *kaiein*, to burn.] A substance that burns the flesh. Caustic lime is slaked lime, also quicklime. Caustic potash and soda are the hydroxides, Caustic silver or lunar caustic is nitrate of silver.

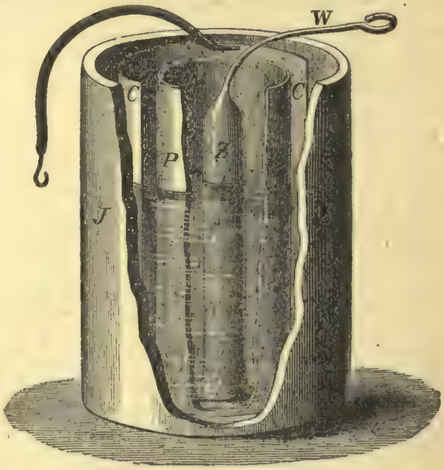
Cave or **Cav′ern.** [L. *cavus*, hollow.] A hollow place underground. Among the most interesting caves are the Mammoth Cave of Kentucky; Fingal's Cave, a basaltic cave in Staffa, Scotland; the Adelsburg caves, in Carniola; and the Luray cave, in Virginia. Many caves contain splendid stalactites and stalagmites. Mammoth Cave has been penetrated for 10 miles, and contains a river and many splendid apartments. The greatest caves occur in limestone strata. Primitive man seems to have dwelt in caves, and bones and implements left by him have been found there.

Ce′dar. [L.] An evergreen tree with spreading branches and hard red wood with a fragrant smell. The chief varieties are the cedar of Lebanon, the white cedar, the American red cedar, the Spanish cedar. Cedar has a pleasant smell, and is much used for making chests and cabinets. The red cedar of Florida is largely employed in making lead pencils.

Cel′andine. [Fr. from Gk. *chelidon*, a swallow.] A plant like a poppy, with yellow flowers, supposed to come and go with the swallows. It is used as a medicine in jaundice and for warts.

Cel′ery. [Fr.] A vegetable of the Parsley family of which the blanched leaf-stalks are used as a relish for food.

Cell. [L.] One of the smallest parts of a plant or animal. All cells have their origin in the primary cell from which the organism was



DANIEL'S CELL.

developed. Also in electricity a jar or vessel, or a division of a vessel, for holding the fluid of a battery. Daniels' cell. *Z*, Zinc rod in porous pot *P*, containing dilute sulphuric acid; *C*, copper in outer vessel containing copper sulphate solution. Also a room in a prison, a sleeping room in a monastery, a small cavity or hollow place.

Cel′luloid. An ivory-like compound of camphor and collodion. It is made into knife handles, pianoforte keys, billiard balls, shirt collars and cuffs, and many other things, and used instead of glass for photographic dry plates.

Cel′lulose. A substance which is the basis of almost all vegetable fabrics. It has recently come into use as a lining for war ships to prevent the inflow of water through shot holes. It does this

by swelling when wet. A preparation was first used for this purpose made from the fibrous husk of the cocoanut, but a better article is now in use obtained from the pith of the cornstalk.

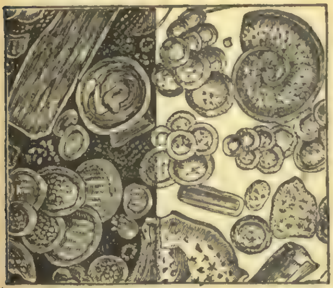
Cem′ent. The best-known cements are Portland and Roman cements, and are distinguished from mortar by hardening quickly, while mortar hardens slowly. Portland and Roman cements both *set* or harden under water; hence they are generally spoken of as *hydraulic* cements, although they are often used in superior masonry which is not intended to be covered by water. Portland cement is made of chalk or ground limestone mixed with clay or shale. Roman cement is made from a natural mixture of lime and clay. Of the natural cement stones found in the United States, the best are the Rosendale cements of New York. A cement made of carbonate of magnesia is superior in strength and hardness to all others. For ordinary cementing plaster of Paris is very useful, and there are many cements to mend broken glass, ivory, wood, etc.

Cen′tipede or **Cen′tiped.** [L. *centum*, a hundred; *pes*, foot.] An animal with one hundred feet or with many feet. They are also many-jointed. Large, flat-headed, venomous kinds live in tropical countries.

Centre of Gravity. The point in a body at which we may suppose the whole weight of the body to be collected; and therefore so long as this point is supported the body will rest indifferently in any position.

Chaf′finch. [O.E.] An English song bird, said to like chaff, and valued as a cage-bird. (See *Finch.*)

Chalk. [AS.; L. *calx*.] A form of soft limestone, widely spread in parts of Europe; not found in America. In southeast England it forms a bed nearly one thousand feet thick. If we pour a drop of vinegar on a lump of chalk, there is a bubbling up, or effervescence, which is due to carbonic acid gas escaping from the chalk. The chalk, in fact, is nearly pure carbonate of lime, which is a compound of the metal calcium with carbon and oxygen. All limestones can be detected in this way by pouring on them a few drops of some acid. Most limestones are composed of the shells or hard parts of the coral-building animals, but chalk is composed of the shells of minute swimming or floating animals, whose hard parts, after death, sank to the bottom and collected into thick layers. These were afterwards uplifted to the surface and became cliffs or beds of chalk. Chalk is used in connection with the *blackboard* in lecture-rooms and schools. Various preparations of it are made for pastel colors. It is also used as a manure.



Chame′leon. [L.] An animal of the Lizard tribe which has the power of changing its color at will. In a dark place it is white or grayish, but when light is admitted its color changes to red, green, or brown, in accordance with the color of its location. It lives in trees, and has a very extensible tongue, covered with a sticky secretion, by which it can seize insects and draw them into its mouth.

Cham′ois. [Fr.] An animal of the Antelope family which is found in the Alps at a height of more than 8,000 feet above the sea-level. It is like the goat in its looks and habits. Its horns are peculiar, rising straight from the crest of the head for some inches and curving backward suddenly so as to form a pair of sharp hooks. Its hind-legs are longer than its fore legs, so that in descending mountains its hind feet catch rough places and its fore feet are set close together and pushed forward. It is acute in scenting man at a distance, and footprints in the snow will alarm the wary animal. The chamois live in herds, and when grazing they post one of their number to give the alarm; but if danger comes, they see it so quickly that often they make off before the signal is given. The skin of the chamois is much valued for making chamois leather, which combines softness with tenacity. "Chamois leather," or wash-leather, is now made from the flesh side of sheep skins.

Champagne′. [Fr.] A light wine, of several kinds, originally made in Champagne, France. This wine contains much carbonic acid gas, which causes effervescence when poured out.

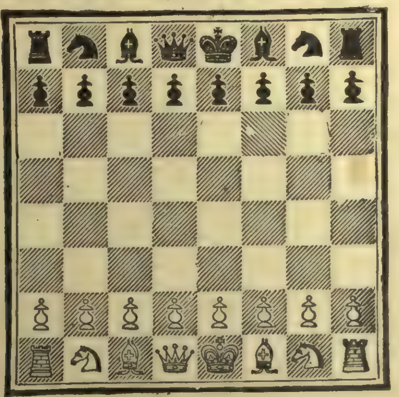
Char′coal. [AS.] The most common form of carbon. The purest form is animal charcoal, called also *bone black* and *ivory black*. It is prepared by heating bones in a vessel nearly closed; the volatile matters are driven off, and bone black is left. It is used in purifying sugar and in the filtration of water. Wood charcoal is prepared by burning wood with a limited supply of air; only the more volatile constituents burn away, and the greater part of the carbon is left. Charcoal so prepared is black and brittle; it retains the form of the wood from which it is derived. Other forms of charcoal are gas-carbon, coke, and lamp-black. It has a remarkable power of absorbing gases, and has therefore valuable uses in medicine and as a substance for respirators. It is used as a deodorant, and as a disinfectant in hospitals and dissecting-rooms. It is also largely employed in the manufacture of gunpowder.

Chart. [L., *charta*, paper.] A map especially for the use of seamen. *Heliographic*, of the sun; *selenograpic*, of the moon.

Cheese. [AS., from L. *caseus*, cheese.] Curd of milk pressed hard. By adding rennet to milk, the nitrogenous substance called *casein* is made to curdle or coagulate; and it is separated from the whey by straining. The curds are pressed into shape in moulds and then dried. The best

cheese is made from new milk—that is, from milk which has not lost its cream. The richest kind of cheese made in England is called *Stilton cheese;* it is made from milk to which cream has been added. *Cheddar cheese* is made from good new milk, while some other kinds are made from milk partly or fully skimmed of its cream. *Gruyere cheese*, made in Switzerland, is flavored with herbs. *Roquefort* is made from the milk of sheep and goats. Skim-milk cheese is a flesh-forming food, because it consists chiefly of *casein;* new-milk cheese is a flesh-forming *and* a heat-producing food, because it contains the casein and *also* the milk-fat or cream. One hundred pounds of cheese contain 30 lbs. of fat. Cheese in America is principally made in large factories, largely in New York State. The annual production in the United States is about 50,000,000 pounds. (See *Curds*.)

Chem′istry. [Gk.] The Egyptians, Greeks, and Romans were acquainted with many of the substances known to us at the present day, and also with the method of their preparation; but among those nations nothing was known of chemistry as a science. During the Middle Ages the alchemists experimented with numerous substances, more especially with such as were of a metallic nature, with the object of turning them into gold. In this way they discovered some important substances. Dr. Black's discovery of "fixed air," or carbonic acid, in 1756, led the way to the discovery of other gases by Cavendish, Rutherford, Priestley, Scheele. The discovery of oxygen by Priestley in 1774 enabled Lavoisier to explain the true nature of combustion. Next came the discovery of the laws of chemical combination by Dalton, and the publication of his atomic theory. Sir Humphrey Davy, by decomposing potash and soda in 1807, laid the foundation of electro-chemistry. The



CHESS BOARD.

most important advances in chemistry were made during the nineteenth century, and in organic chemistry progress has been very rapid.

Cheroot′. [Tamil.] A kind of cigar originally made in Manilla; now a cigar of inferior or adulterated tobacco.

Cher′ry. [Fr., from Gk. *kerasos*] A tree of the Prune or Plum family bearing a red stone-fruit, which is much esteemed for dessert purposes and for conserves. There are several hundred varieties of the common garden cherry. The wild or black cherry of the United States is a beautiful and useful tree, its wood being much esteemed by cabinet-makers. Its fruit is not very good for eating. Cherry brandy or rum is brandy or rum in which cherries have been steeped.

Chess. [Fr., from Pers. *shah*, a king.] A game played by two persons on a board divided into squares. Each player has a king, a queen, two bishops, two knights, two castles, and eight pawns. The king, when made prisoner or checkmated, is assumed to be dead, and the game ends. There is no game requiring more skill.

Chest′nut. [Fr., from Gr. *kastanon*, a chestnut.]

A tree with white or red flowers like spikes, and a fruit of a reddish-brown color, enclosed in a green prickly husk, the nuts being covered by a thick firm skin. The timber is hard and lasting, and used for ornamental work, furniture, etc. The bark is used in tanning. The chestnut is found in Europe, America and Japan. The European chestnut bears a much larger fruit than the American, but not so sweet. Its starchy contents are used for bread-making in Italy.

Chick′weed. The name of several weeds, especially *Stellaria media*, the seeds and buds of which are a favorite food of small birds.

Chic′ory. [L. *cichorium*.] A common European plant, known also as *succory*. It is somewhat like the dandelion, and a substitute for coffee is obtained from its root by roasting and grinding. It is mixed with coffee or used by itself. Chicory can easily be distinguished from coffee by placing some of it in water. It rapidly sinks, and colors the liquid a reddish-brown; but genuine coffee floats, and does not color the water. The chicory or succory plant grows on limy soils and by the dusty roadside. It has large bright blue flowers and toothed leaves. It is introduced in America where the blue and white-flowered varieties are common.

Chil′blain. [AS.] A swelling produced by the exposure of the hands or feet to cold and sudden heat.

Chimpan′zee. [Fr.] A West African ape which is more like man in some ways than any other ape. When full grown it is 4 feet high. It has no hair on the hands and face, and none on its large rounded ears. Its arms are shorter than the orang's, but fall below the knee. Its habit in walking is to bend forward and rest on the hands. When tamed it has been taught to eat food with a spoon at a table, but in the wild state it lives among the branches of trees near the ground.

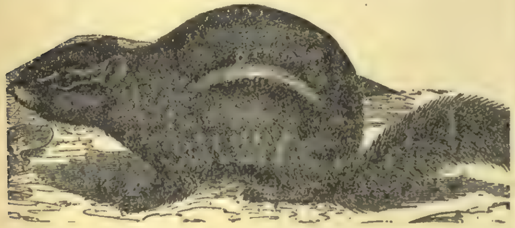
Chi′na. A fine kind of ware first made in China, and first brought from China in the seventeenth century. (See *Porcelain.*) China ink is India ink.

Chinchil′la. A South American rodent like a squirrel, with five-toed fore feet and four-toed hind feet, and a large bushy tail. Its soft fleecy fur is much valued. It is a shy animal, with nocturnal habits.

Chine. [Fr.] A piece of the backbone and surrounding flesh of an animal cut for cooking.

Chintz. [Hind.] Cotton cloth printed with colored patterns, and often glazed. (See *Cotton.*) Chintz is used for bed-hangings and to cover furniture.

Chip′munk. A small American squirrel, marked with black stripes on a yellowish-brown skin; thence called striped squirrel; also ground squir-



rel, since it lives in the ground, in which it burrows and makes its nest. It lives on seeds and nuts, which it carries in cheek pouches and stores up in its holes. It is also called cheeping squirrel, from the noise it makes. Its worst enemy is the weasel, which follows it into its burrow.

Chlo′ral. [Gk.] A chemical substance prepared by acting on pure alcohol with dry chlorine gas. It is a limpid, colorless liquid. With water it forms *chloral hydrate*, a crystalline substance, largely used for the purpose of obtaining quiet sleep.

Chlo′rides. [Gk.] Salts formed when chlorine gas unites with metals. The only chloride which occurs plentifully in nature is sea, or rock-salt, which is a chloride of sodium.

Chlo′rine. [Gk. *chloros*, light green.] One of the non-metallic elements, discovered by Scheele in 1774. It is prepared from common salt by the action of sulphuric acid on manganese dioxide. It is a transparent gas of a greenish-yellow color, which does not occur free in nature. United with the metals sodium, potassium, and magnesium, it forms the chief salts of sea-water. Chlorine is a powerful bleaching agent, and this action depends upon the power which it possesses of combining with the hydrogen of water, and so setting free the oxygen.

Chlo′roform. [Gk. *chloros*, light-green, and *formyl.*] A heavy, colorless volatile liquid, possessing an agreeable odor, like ether; it has a sweet though acid taste; it is only slightly soluble in water; it dissolves sulphur, phosphorus, gutta-percha, iodine, and fatty and resinous substances. It was discovered in 1831 by Guthrie in America, and attention was first called to its anæsthetic properties by Flourens in 1847, regarding its effects on animals; and soon after this Simpson of Edinburgh introduced it as an anæsthetic in medical practice. Its effect on the nervous system is to cause a suspension of voluntary motion and of sensation, while respiration and the action of the heart are continued.

Chlo′rophyl. [Gk. *chloros*, light-green; *phylion*, leaf.] The substance which gives plants their green color. It is a resinous substance, whose chemical composition is not exactly known.

Choc′olate. [Span. or Aztec.] A sweetmeat made from cocoa. (See *Cocoa.*)

Chol′era. An epidemic intestinal disease, which seems native to Southern Asia, and has at various times swept with terrible destruction of life over Europe and America. It produces severe and painful cramp, often quickly followed by death. It is now known to be due to a form of bacteria (*q. v.*), and recent epidemics have been checked by sanitary measures.

Chough. [AS.] A bird of the Crow family, of a black color, and with a long, slender, curved bill and red legs. The Cornish chough is the sea-swallow.

Chrome or **Chro′mium.** [Gk.] A hard, fusible, and brittle metal. Potassium chromate and lead chromate (chrome red) are used in dyeing and calico-printing. Chrome yellow is used by painters. Pure chromium is the most difficult to fuse of all the metals. Its compounds are much used in the arts, in painting and coloring. It forms four compounds with oxygen, and its chief ore is chrome ironstone, found in America, Sweden, and the Shetlands.

Chronom′eter. [Gk. *chronos*, time; and *metron*, a measure.] An instrument for the exact measurement of time. The name is commonly applied to a portable time-keeper, in opposition to a clock, which is stationary. In chronometers the balance-wheel is compensated, so as not to be affected by changes of temperature.

CHRYSALIS.

Chrys′alis. [Gk. *chrysos*, gold.] The pupa or yellow form which many insects take before they get their wings. When the larva of the butterfly leaves off eating, it enters the chrysalis state. Wrapped in a dry skin, and hanging head downward, suspended or tied by a silken thread, it remains seemingly dead. A marvellous change is going on, and when the skin bursts a fullgrown butterfly appears.

Chry′santhemum. [Gk. *chrysos*, gold; *anthemon*, flower.] A family of perennial plants, consisting of the ox-eye daisy, feverfew, but chiefly the garden chrysanthemum, of which there are 1,500 varieties, some of them of great size and beauty. Some have their petals rolled up like quills. This flower was introduced from China or Japan about 1764.

Ci′der. [Fr.] A drink made from the juice of apples. Besides being used as a beverage, it is used for making vinegar and cider-brandy.

Cigar′. [Span.] A small roll of dried tobacco leaves for smoking. Originally a kind of tobacco made in Havana, Cuba, where the finest are made. In the United States very many million cigars are made annually, and large numbers are also made in Havana.

Cigarette′. [Fr.] A roll of loose fine tobacco rolled in paper for smoking.

Cincho′na or **Cascaril′la.** A tree growing in the Andes and in the East Indies, from the bark of which is procured Peruvian bark, which yields quinine, a substance of great medicinal value in fevers. In the 17th century the wife of Count Cinchon, Viceroy of Peru, was cured of fever by the bark of this tree, hence the name.

Cin′nabar. [L. *cinnabaris.*] Red sulphide of mercury, or vermilion. It occurs as crystals. It is used as a paint and in medicine. *Cinnabar grecorum* is a red resin used for coloring varnishes, and known as dragon's-blood.

Cin′namon. [Heb. *qinnamon.*] The bark of a kind of laurel tree found in Ceylon. It is aromatic, pungent, and used as a cordial. With cassia it yields the oil of cinnamon. Cinnamon is used in medicine, cooking, and confectionery.

Cir′cle [L. *circus.*] A plane figure contained by one line called the circumference, and such that all straight lines drawn from a point within the figure, called the centre, to the circumference are equal. Any straight line drawn through the centre of a circle, and terminated both ways by the circumference, is called a *diameter*. A line from the centre to the circumference is called a *radius*. Two diameters at right angles to one another divide a circle into four equal parts called quadrants. Each of these is divided into 90°, so that the whole circumference of a circle contains 360°.

Circula′tion. [L.] The movement of the blood through the vascular organs of animals. In birds and mammals, the air-breathing animals, the circulation is double (pulmonary and systemic), and is carried on through the heart (*q.v.*), the arteries, and the capillary tubes. In reptiles the heart consists of two auricles, and one ventricle, and there is an incomplete double circulation. In fishes, which are water-breathing animals, there is a simple circulation —the heart consisting of a single auricle and a single ventricle, the blood taking in oxygen and giving out carbonic acid in the gills instead of the lungs, which are absent in fishes.

Cis′terns. [L. *cisterna*; from *cista*, box, chest.] Receptacles for water. They are generally square or round in shape, and are commonly lined with lead. Soft water acts upon lead, dissolving it and forming carbonate of lead, which is a poisonous substance. It is the bright, clean lead which is affected. After the lead has become dull, or crusted over, the water can no longer dissolve it.

Cit′ric Acid. An acid which is found in lemon juice, and which also occurs along with tartaric and malic acids in many other fruits—such as oranges, cherries, currants, garden rhubarb, etc. It is prepared from lemon or lime juice. It crystallizes in large colorless crystals, which dissolve freely in water. When dissolved in syrup it is kept for use in the manufacture of lemonade. It is used by calico-printers, and in the dyeing of silk.

Cit′ron. A fruit of the same family as the lemon and orange, and of the shape of a lemon, but larger and rougher, while its juice is not so sour. It is a native of the south of Europe and Asia. A favorite confection is made of its peel preserved in sugar, and oil of citron is made from the peel and the leaves. Citric acid is sometimes made from its juice.

Clam. A bivalve shell-fish found in many seas, one species being the common edible clam abundant in the United States, and much used as food. There are many varieties—as long clam, round clam, sea clam, little-neck clam, and giant clam. The long clam burrows in the sand with the muscular organ usually known as its foot. Its shell grows at the hinge, and increases as fast as the animal grows. The giant clam is an inhabitant of the China Sea and South Pacific, and is the largest known bivalve mollusc, the shells being known to measure 2 feet in length and weigh 500 lbs.

Clar′et. [Fr., from L. *clarus*, clear.] A wine of a red color; first applied to Medoc wines, and then to red Bordeaux wines.

Clar′inet or **Clar′ionet.** [Fr.] A wind instrument blown by a single reed, and usually a leading instrument in a military band.

Clarion. [Fr.] A trumpet with a loud, clear sound.

Claw. [AS.] The toe nail of a beast or bird. The claw of the lion may be unsheathed or put out, and withdrawn or sheathed. The claws of the dog, which catches its prey with its teeth, are blunt, and cannot be withdrawn. The hawk and the eagle, that seize their prey alive, have all their toes or claws long, curved, strong, and sharp; but the vultures, that feed on dead animals, have short hind toes, nearly flat front ones, and all very weak. The bustard has no hind toe. Each foot of the spider has three claws: the middle one is bent over for clinging to the web; the other two have teeth like a comb, and are used sometimes for cleansing the limbs and webs.

Clay. [AS.] A fine-grained, sandy substance, derived from the decay of aluminium silicates. It is white when pure, but it is generally mixed with impurities which impart to it various shades

of gray, brown, red, purple, or blue. When dry it is friable, and when wet can be kneaded between the fingers. When shaken with water it becomes mud. It is largely used for making bricks and earthenware.

Clem'atis. A climbing plant of many kinds, found in most temperate regions, with beautiful flowers, having feathery styles that enlarge in the fruit.

Clock. [Celt.] A machine for measuring time, with wheels moved by weights or springs. It is usually made so as to tell the hour by the stroke of a hammer on a bell. An *alarm clock* has a mechanism to ring a gong at a set time. An *astronomical clock* has a compensating pendulum. An *electric clock* is regulated or moved by electricity. A *sidereal clock* keeps sidereal time, and is fitted on large telescopes.

Clouds. When vapor is condensed high up in the air, it receives the name of cloud. The three fundamental forms are—*cirrus*, *cumulus*, and *stratus*. The *cirrus* consists of fibrous, wispy, or feathery clouds, placed in the highest region of the atmosphere. *Cumulus* (heap cloud) consists of rounded masses commonly seen in the sky in summer, supposed to be formed by columns of ascending vapor, the upper portions of which have condensed. *Stratus* is a horizontal sheet, frequently formed at sunset, but which disappears again at sunrise. These primary forms combine into intermediate forms, and are all combined in the *nimbus* or storm-cloud, that from which rain falls. The average distance of clouds from the earth is between one and two miles, but streaky, curling clouds are often six or more miles high.

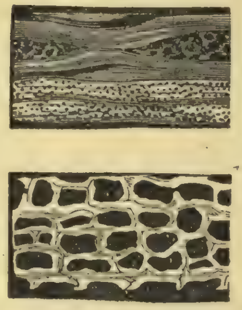
Clo'ver. A leguminous plant grown for fodder. It is one of the most useful crops a farmer can grow. Its roots collect and store up a large amount of plant-food. The common broad or red clover is the kind most generally grown. The white or Dutch clover grows in good pasture land; each stem bears a single head of flowers. Sheep are very fond of it. Crimson clover gives one excellent hay crop. Swedish clover, on the contrary, will grow strongly for two or three years in succession, yielding a very fair crop each year. It has a pink flower, and bears cold and wet well.

CLOVES.

Cloves. [Fr.] The clove tree is of the Myrtle order, and is a native of the Spice Islands, but is now cultivated in Zanzibar and the West Indies and other tropical countries. It resembles the laurel, and grows to a height of from 15 to 40 feet. Its leaves are large and oblong, its flowers small and dark red, and its fruit is like an olive in shape, but red like the flowers. The fruit, when dried, is known as "mother of cloves." The cloves used for flavoring are the unopened flower-buds. These buds become dark-brown, and look like nails; and so they take their name from *clou*, the French word for nail. The little ball which seems to form the head of the nail is really composed of the petals of the flower, and will unroll if soaked in water. Cloves are used for their strong aromatic taste in flavoring food such as puddings, cakes, and preserves. *Oil of cloves* is useful in medicine, and to scent toilet soap.

Coach. [Fr., from Gk. *conche*, a shell.] A framework with cover and seats, set on wheels, for carrying people, having doors in the sides and an elevated seat for the driver. *Mail coaches* and *tally-ho coaches* often have four seats inside and seats for twelve outside.

Coal. [AS.] A black substance (consisting mainly of carbon), dug out of the earth, which burns and gives heat. Coal is of compact but brittle structure, and found in seams and beds, and is the remains of a luxuriant vegetation which flourished on the earth's surface during the Carboniferous age, and to some extent in other geological periods. It is supposed to be due to the action of heat and pressure upon great accumulations of this material. There are many varieties of coal, distinguished from one another by the varying proportions of the different constituents. *Bituminous coal*, such as is in general use, contains from 75 to 80 per cent. of carbon, 5 to 6 of hydrogen, and 10 to 12 of oxygen. *Anthracite* is the most completely mineralized variety, and contains about 90 per cent. of carbon, the gases oxygen and hydrogen having been driven off. *Cannel coal* and *lignite* contain less carbon and yield more ashes than those named. The present yearly output of coal in Great Britain and the United States is about 200,000,000 tons in each. Other countries yield much less. Some of the mines are very deep.



COAL UNDER THE MICROSCOPE.

Coal-tar. A thick black liquid, obtained during the distillation of coal for the manufacture of illuminating gas. This substance yields madder, a coloring substance formerly obtained from the roots of a plant. One ton of cannel coal when distilled leaves 12 gallons of coal-tar, from which are produced 1 lb. of benzene, 1½ lb. of carbolic acid, and a number of other substances used for dyeing purposes. From these substances there may be obtained 16 distinct yellow colors, 12 orange, 30 red, 15 blue, 7 green, 9 violet, besides a number of browns, and an indefinite number of blendings.

Coat. [Fr.] An outer garment for the upper part of the body, chiefly worn by men.—*Coat of arms* (translation of *cotte d'armes*, small coat worn over armor), the heraldic bearings of any one.

Co'balt. [Ger. *kobalt;* from *kobold*, a goblin.] A reddish-white metal, very tenacious, and very difficult to fuse; occurs in small quantities in meteoric stones, and is usually found combined with arsenic and sulphur. It forms three compounds with oxygen. One oxide imparts a deep-blue color to glass. This glass, reduced to powder, is used in producing the blue colors in porcelain, pottery, glass, encaustic tiles, etc. Chloride of cobalt diluted forms sympathetic ink.


COPRA DE CAPELLO.

Co'bra de Ca-pel'lo. [Port.] The hooded snake, a very venemous serpent found in India. Its hood is formed by the skin of its neck, which it can draw over its head. Ordinarily it is like other snakes, but when going to strike the head broadens out. It is usually carried about by snake-charmers; but in India many people die from its bite every year.

Coch'ineal. [Span.] A dye got from the dried bodies of insects found on a cactus in Mexico, Central America, etc., and yielding carmine red.

Cock. The male of a hen, particularly of domestic fowls; also a valve for drawing liquids; and a small pile of hay. *Weathercock* is a vane in the shape of a cock.

Cockatoo'. [Malay.] A bird of the Parrot family, having a short, strong, and much-curved beak and crested head. Among the many varieties are the sulphur-crested, broad-crested, and the great black cockatoo of Australia.

Cock'chafer. A beetle; called also may-bug or dor-beetle. (See *Beetle.*)

Coc'kle. [Celt.] A kind of shell-fish, a bivalve with radiating ribs, used in Europe as food; also a weed among corn—applied to the corn-rose and darnel.

Cock'roach. An insect of the straight winged family, of which there are many species, some living in the woods under stones, leaves and rotten logs; others, infesting houses, where they eat both animal and vegetable food, swarming out of their holes at night. There are two kinds common in houses, one small, and one quite large. They may be destroyed by poison or driven away by borax, which they do not like.

Co'coa. The product of the fruit of chocolate tree, a native of Mexico, Central America and Brazil. It is a handsome tree, 10 to 20 feet high, and is sheltered when growing by larger trees. It commences to bear fruit in the third year. The fruit is cucumber-shaped, and consists of a hard outer part from 6 to 8 inches long, and a soft white pulp, which protects numerous seeds almost as large as almonds. The seeds are cleaned, dried, and ground by hot rollers to a paste or powder, which is known as rock or flake cocoa. Sometimes they are broken up by rollers into pieces, which are called cocoa nibs. Mixed with sugar and spices, flake cocoa is known as chocolate, and is used in cakes and sweetmeats. About one-half of the weight of the seeds is due to a fat called cocoa butter; much of this is removed in making chocolate. The active principle of cocoa is theobromine, a nitrogenous product.


COCOA.

Co'coa-nut. The nut of the cocoa-palm. The tree grows in tropical countries to a height of from 60 to 80 feet, and is without branches, the leaves and clusters of nuts being at the top. The nut has a milky fluid, and a white meat of albumen which yields an oil. The cocoa-palm is found in all parts of the tropics, and is a very useful food-plant, while its nuts are used in large quantities in temperate regions for confectionery and other purposes. (See *Palm.*)

Cocoon'. [Fr.] The case spun by insects to cover them, especially the oblong case of the silk-worm in its chrysalis state, which is formed of threads of silk spun by the insect in its larval state, and from which the silk of commerce is prepared.

Cod. [Goth.] An important sea-fish, used as food, and taken in immense quantities on the northern coasts of Europe and North America.


COFFEE-PLANT

It is very abundant and large on the Banks of Newfoundland. There are several kinds—shore-cod, in shallow water; rock-cod, often mottled. Cod-liver oil is obtained from the liver of the cod-fish, and is used extensively in medicine to supply the body with fat.

Cof′fee. The fruit of a tropical evergreen tree from whose beans is prepared a favorite beverage. In its wild state the coffee tree grows from 20 to 30 feet high, but when cultivated is not allowed to grow more than 8 or 10 feet. Its flowers are small, white, and fragrant-smelling, and grow in thick clusters. Its berry or fruit is like a cherry, and contains two seeds or beans. The first crop of fruit appears when the trees are three years old. The plants bear fruit for many months, so that several crops can be gathered in a year. The berries are dried; then the beans are removed by rollers from the pulp that surrounds them. Coffee thrives in moist, warm countries, as Abyssinia, Arabia, Brazil, Ceylon, Java, and the West Indies. To *make* coffee, the beans are roasted and then ground to a fine powder. Boiling water is then poured on the ground coffee; this dissolves a substance called caffein. The best coffee is the *Mocha*, grown in Arabia. *Java* coffee is also of fine quality. There are many other varieties, differing greatly in flavor. Coffee is used very largely in the United States.

Cog. [Celt.] A tooth or cam on the rim of a gear-wheel for imparting or receiving motion. A cog-wheel is a gear-wheel with cogs or teeth.

Co′gnac. A kind of French brandy, so named from the town Cognac.

Coin. [Fr., from L. *cuneus*, a wedge.] A piece of metal stamped to be used for money. It is round, flat, bright, hard, and durable. Alloys of the metals are generally used. They are melted into ingots, rolled into ribbons to the required thickness, and punched, rounded, milled, and stamped with a die and counter-die, and weighed.

Coke. [O.E.] Mineral coal from which bitumen, sulphur, or gas has been extracted by roasting in a kiln or oven, or by distillation, as for gas. It is smokeless, and is largely used in steel works and in foundries.

Cold Storage. A method of preserving food substances by keeping them in a low temperature. Freezing machines are used to chill the air for this purpose. This system has come widely into use, cold storage rooms being provided in all our large cities in which vegetables, fruits, and meats can be kept for any desired length of time. They are of much use in markets to preserve the material left unsold. Cold storage meats need to be used soon after being thawed out, as they spoil more quickly than unfrozen meats.

Cold Wave. The name given in the United States to spells of severe depression in temperature, usually the effect of anti-cyclonic conditions arising in the great plains of western Canada.

Col′lie. A Scotch shepherd dog remarkable for its intelligence. There are two breeds, rough-haired and smooth-haired.

Collo′dion. [Gk. *kolla*, glue; and *eidos*, like.] A substance formed when gun-cotton is dissolved in a mixture of alcohol and ether. It is used in photography for the purpose of forming a thin film on the glass which is to receive the silver salts on which the image is formed. Combined with camphor it forms celluloid (*q.v.*)

Cologne′ or **Cologne Water.** A perfume made of alcohol flavored with essential oils. The oils of many flowers are used, though much of the cologne sold is a cheap imitation of the real article. It was named from the city of Cologne, where it was first made.

Co′lon. [Gk.] The mark (:) used at the end of a clause complete in itself and nearly independent. *Semicolon*, the mark (;) used to indicate a separation more distinct than the comma.

Col′o′r. [L.] The term used to express the different sensations which are produced when light of different kinds enter the eye. When ordinary white light is passed through a prism (*q.v.*), it is decomposed into seven colored rays—violet, indigo, blue, green, yellow, orange, red. There are three primary color sensations—red, green, and violet; and the blending of these in different proportions gives rise to all the other colors.

Col′umn. [L.] A long round piece of stone, wood, or metal set on end to hold up or adorn a building. It is usually ornamented, and composed of base, shaft, and capital. A clustered column is a column composed of several smaller columns. (See *Capital.*)

Com′ets. [Gk. *kome*, hair.] A wandering class of heavenly bodies. As seen through a powerful telescope, a comet consists of an ill-defined mass of light called the head, which is much brighter towards the centre, presenting the appearance of a *nucleus* like a star or planet. Surrounding the nucleus there are certain definite layers of luminous material, which seems to unite behind the head, and from which a luminous train called the tail proceeds. The direction in which the tail points is always opposite to that of the sun. There are many comets revolving round the sun in very elliptic orbits, almost touching the sun at one end of the orbit and very distant at the other. Other comets are supposed to come from the depths of space. Some of them break up into fragments and form meteoric rings.

Com′mon. [Fr.] A piece of land to which all have right for pleasure or pasturage.

Com′pass, Mar′iners. A magnet (*q.v.*), when suspended horizontally, always points in a direction nearly north and south; and on this principle has been constructed the mariner's compass, an instrument of great value to sailors, as showing them in what direction to steer. In the compass the needle is fitted up in such a way that it will always remain horizontal whether the ship is pitching or rolling. The needle is firmly attached to a circular card (called the compass card), which is divided into thirty-two equal parts by lines drawn from the centre to

the circumference. The mariner's compass was brought from China to Europe during the thirteenth century.

Compress′ed Air. One of the first important uses of compressed air as a source of power was in the excavation of the Mount Cenis and the Hoosac Mountain railroad tunnels, in which air compressed by water power was conducted by pipes into the depth of the tunnels. Another important use is in the air-brake on railroad trains. It is used for many other purposes, an important one being the propulsion of street cars by compressed air motor engines, and another one the driving of letters through tubes from the central to the branch offices of some large cities.

Concerti′na. [Ital.] A small musical instrument like an accordion, with bellows, having reeds inside and keys and handles on each of two six-sided heads.

Con′crete. [L.] A hard building material made of gravel, pebbles, sand, and pieces of stone held together by cement (*q.v.*), or tar, used for sidewalks, foundations, and submarine structures.

Con′dor. [Span.] The largest of known vultures. It is of the vulture kind, and lives on the highest Andes, building its nest 15,000 feet above the level of the sea. In winter these birds descend in groups to feed on the low grounds and the seashore. They possess the instinct of discovering a dead or dying animal at a very great distance, and though they feed principally on carrion they will sometimes seize living animals. The condor is usually 4 feet long, and has 9 feet spread of wing.

Cone. [Fr.] A figure with a round base tapering to the top or vertex. Also the fruit of firs, cedars, and other trees known as conifers, composed of woody scales, each of which has one or two seeds at its base.

Congou. [Chin.] Black tea of higher grade, finer leaf, and less dusty than bohea. It means "well worked." In the United States it is called "English breakfast tea."

Constella′tion. [L. *con*; and *stella*, a star.] The name given to the artificial groups of stars. The figures of men and animals were of old supposed to be outlined in the sky, and mythological names were given to them. The stars in a constellation are distinguished by the Greek letters *a*, *b g*, *d*, etc.; as *a* Tauri (*Alderbaran*), first star in Taurus, or *g* Orionis (*Bellatrix*), third star in Orion.

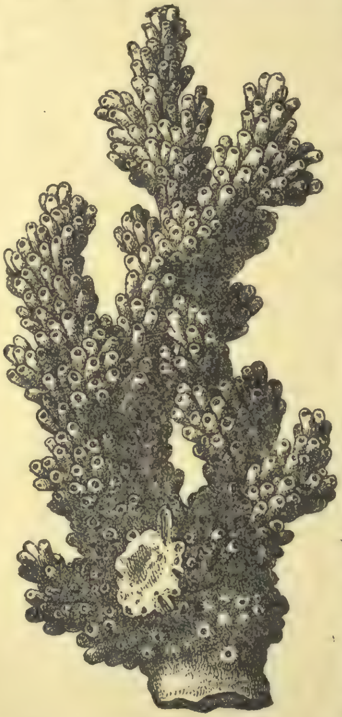
Convolv′ulus. [L.] A monopetalous plant with twining stems, including the bindweed, with flowers beautifully colored. Morning glory, and sweet potato belong to the same family, and are first cousins to convolvulus.

Co′ny. [O.E.] A kind of rabbit. The cony of Scripture is the daman or rock-rabbit.

Coot. [Du.] A short-tailed water bird. It is the common mud-hen of the marshes, and is interesting because of its lobed foot, which has flaps on the sides of the toes. The European coot is named the bald coot, in allusion to the bald or bare patch on the front of its head. There are several American varieties.

Co′pal. [Span.] A resinous substance consisting of the dried juice of various trees growing in Zanzibar, Madagascar, India, and South America. In Africa also it is dug from the earth where forests once stood. It is sold in rounded masses, and in appearancc resembles amber. After being melted, it becomes soluble in alcohol; and in this way varnishes and lacquers are prepared.

Cop′per. [O.E.] A metal, so called from the island of Cyprus, where the Greeks and Romans obtained it. Metallic copper is found in the United States, but it is generally prepared from its ores, of which there are several, found in most European countries, as well as in North and South America, Africa, Australia, and Japan. The principal localities in the United States are Michigan, Montana, and Arizona. It can be obtained from its ores at a comparatively low temperature; which accounts for its extensive use in the early stages of civilization. Metallic copper possesses a deep, red color, takes on a brilliant polish, is very malleable and ductile, and as a conductor of heat and electricity it comes next to silver. It is not acted on by water, nor by exposure to dry air, but in moist air it becomes coated with green carbonate. Red oxide of copper is used for coloring glass. Blue vitriol is the sulphate, and is much used in dyeing and in the preparation of paints. Copper mixed with tin is bell-metal, and with less tin is bronze; with zinc, it is brass or pinchpeck.



CORAL.

Cop′per-plate. A plate of copper on which pictures or writing are engraved. In printing from copper the lines are filled with ink, the surface is wiped clean, and the impression taken by pressing paper under the roller of a press.

Cor′al. [*Animal.*] A minute creature, of low organization, which builds itself a framework of carbonate of lime, which is lined with the fleshy body of the living animal. Corals live in colonies in the warm seas, and their combined shells form

great masses of coral rock, which in some regions become reefs or islands. They cannot exist at a depth greater than from 90 to 120 feet, and they also die by exposure to the air, so that from a depth of about 100 feet they work upwards until they reach low-water mark; and when their progress is thus stopped in the upward direction, they begin to grow outwards, increasing on the outer edges of the reef, where they find food, carried by the ocean currents, most abundant. The action of the waves and the chemical action of the sea-water cement the materials into a firm steep slope. When a reef has been built on a shelving sea-bottom near a continent or round a volcanic island, the space of water inside is called the *lagoon channel*. When the reef has been built on a submarine ridge or peak, it forms a circular island, called an *atoll*, with a broad lake of sea-water inside, called a *lagoon*.

Corduroy′. [Fr.] A thick cotton cloth with the surface in ridges.

Cork. [Span.] The bark of a tree similar to the oak in appearance. The trees grow for 15 years before the cork is gathered, and some trees live over 150 years. They are found in Spain, Italy, and Portugal. The cork forests of Spain cover 620,000 acres. The bark is cut lengthwise, and stripped off in sheets in July and August. After a year new bark forms, and the process is repeated every three or four years. The sheets are soaked in water and placed under weights, and when dry are ready for use. These sheets are cut into corks by machinery. They are first cut into narrow strips, then they are cut into different-sized pieces for bottles, and then rounded. Cork is used for stoppers because it is elastic, so that after being pressed into the neck of a bottle it fills the space and allows no air to pass in nor any of the contents to escape. Cork is also used for soles of slippers and in the making of life-boats and life-preservers.

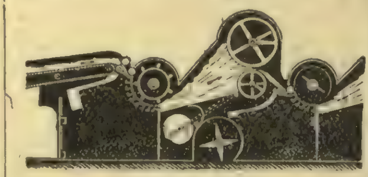
Cor′morant. [Fr., from L. *corvus marinus*, or sea-crow.] A sea-bird which greedily devours fish. It is about the size of a goose, and has a yellowish skin, which, hanging loosely under its bill, forms a wide pouch. The legs are strong and black, and the webbed feet have one claw, indented like a saw. The cormorant is wont to fish with its head under water, and it has such a clear eye and dives so well that it is able to be under the waves till it catches its fish. Fish after fish will disappear into the skinny pouch under the bill. It is said a cormorant can devour 4 lbs. of fish a day, which is half its own weight. If a fish is too large to swallow, it will toss it up in the air, and catching it again head foremost bolt it more easily. In China, the cormorant is trained to dive and catch fish, but a strap beneath its throat prevents it from swallowing it; each time the fish is taken from it, the bird returns to its work till the owner is satisfied.

Corn. [AS.] In Scotland, applied to oats; in the United States, to maize; in England, to wheat; in Russia, to rye and barley. A collective name for the grains. The corn-producing grasses furnish excellent food for both man and beast. They contain a great deal of starch, and also a fair proportion of such flesh-formers as gluten and fibrin. Wheat and oats are superior as food to barley and rye, containing more flesh-forming matter and less water. Wheat is, as a rule, too expensive a food to give to cattle, but the bran, which consists of the outer coating of the grain of wheat, is a very useful food for cattle and horses. It is rather indigestible, and should first be scalded in boiling water. Oats and maize are largely used for animal food.

Cor′net. [Fr.] A wind instrument made of brass, furnished with valves moved by small pistons or sliding rods, and used in bands and orchestras.

Corolla. [L.] The colored envelope of a flower which surrounds the organs of fructification, consisting of one or more leaves called petals.

Cot′ton. [Fr.] The cotton plant is an annual, and belongs to the same order as the marshmallow and the hollyhock. Originally it was a native of Asia, but it is now cultivated in almost all warm countries, especially in the southern portions of the United States, India, China, Egypt, Brazil, and the West Indies. The plant grows to various heights in different countries, varying from 2 or 6 feet to 9 or 10 feet. Its leaves are dark green, and its flowers are large and usually white or bright yellow. As each flower drops a seed-pod takes its place. These pods are three-sided, and about the size of a walnut. When ripe these pods burst open, showing within a mass of white fibres, which are the snowy balls of cotton. The pods are gathered and the cotton taken out and dried. The seeds are removed by the cotton-gin, a machine with revolving cylinders, covered with sharp teeth, which tear the seeds from the cotton. The cotton is then pressed into large bales. In making cotton cloth, the cotton is thoroughly cleaned by a cotton-picker, carded, and spun into long, fine threads for the warp or for cross-threads. The spinning-wheel formerly did this, one thread at a time. Hargreaves invented "the jenny," by which eight threads could be produced at the same time. Continued improvements have made the machinery so perfect as to render the process of spinning easy and rapid. Sewing cotton is made by twisting together several of the fine fibres, and winding on reels or bobbins. The weaving of cotton consists in crossing and recrossing the threads in a loom to form cloth.



INSIDE OF PICKER

The threads which extend the length of the cloth form the warp; the threads crossing from side to side form the woof or weft. The fabrics made from cotton include gingham (where the yarn is dyed before being woven), cambric, muslin, lawn, calico, chintz (a kind of heavy calico, gaily colored), corduroy, velveteen, wincey, and other stuffs mixed with silk or wool.

Cotton-Seed Oil. The seeds of the cotton plant, which are left in large quantities after the extraction of the cotton fibre, have become valuable as a source of oil, which, when clarified, is of a clear golden-yellow color. It is used as an adulterant or a substitute for linseed, sperm, lard, olive, and almond oil, for cooking in place of lard or butter, and for other purposes. A large proportion of the salad oil used in the United States is Cotton-Seed oil. The "cake," which is left after the oil is pressed from the seeds, is used as a fodder for cattle and as a fertilizer.

Cow. [O.E.] A hoofed, herbivorous animal, which is one of the most useful of all animals to man. It is somewhat smaller than the horse, has long, smooth horns, large, gentle eyes, and a tufted tail. Its hoofs are cloven. Like the horse, it is a grass-eater; and, like the sheep, it chews the cud. (See *Digestion.*) We seldom take a meal but some of the food we eat or drink is supplied by this useful animal. It gives a large quantity of milk, which is used either as it comes from the cow, in cooking, or made into butter and cheese. Its flesh is called beef (*q.v.*); its fat is made into tallow, from which candles and soap are made; its skin is tanned and made into boots, shoes, harness, and other leather articles; its hair is mixed with plaster; its hoofs are made into glue; its horns are made into combs, spoons, buttons, and the handles of knives and forks; and in some countries in Europe, Asia, Africa, and Australia, oxen are used as beasts of burden or to draw the plough. There are many different breeds, some of which are useful for dairy purposes, others yield good beef.

THE CRANE.

Cou'gar. A large American animal of the cat family, resembling the panther but smaller. It is often called panther (or painter). It is also called the puma, and formerly was known as the catamount, or mountain cat. It crouches in trees in the forests and springs on passing deer. In South America it kills and feeds on wild cattle.

Cow'ry. [Hind.] A small sea-shell, somewhat like a coffee berry and used as money in Siam and Africa. The shell is produced by the mollusc, and the spots on its surface are made by a coloring matter secreted by the mantle.

Cow'slip. [AS.] A kind of primrose with several flowers on one stalk appearing early in the spring.

Cow-tree. [Span.] An evergreen tree found in Venezuela, first discovered by Humboldt. The sap flows freely when the bark is wounded; and it is safe to drink freely, for the fluid, which has the color and taste of milk, is not only cool but refreshing and nutritious. It is, however, acrid and bitter. Also called the traveller's tree.

Crab. [AS.] A shell-fish with strong claws, and a tail tucked underneath its body. The eyes of crabs are on long stalks, and may be turned about or folded back into little grooves in the shell. Crabs breathe by gills, and a crab's heart consists of a single sac. They shed their shells

at intervals, and while the new shell is growing is known as *soft-shell crabs.* These are esteemed as food in the United States. In the tropics some species of crabs live in the fresh water of the rivers; others in the damp forests, visiting the sea-shore to deposit their eggs; others, like the land-crabs of Jamaica, live on the mountain tops. The hermit crab is a curious animal without a shell for its soft body; so it seeks to shelter its body in some empty shell, and when it outgrows one shell hunts for a larger one, sometimes turning out the living owner of a shell it wishes. The fiddler crab has one claw much larger than the other, developed by fighting, which it holds up as it walks sideways. The females of the pea crabs, or oyster crabs, live in oyster shells, and go out and in at will. Horse-shoe crabs, or king crabs, the largest crabs, are dark brown, and have long, stiff tails.

Cran'berry. [AS.] A red berry with a sour taste, growing on a stalk like the neck of a crane. It is cultivated in Europe and the United States, the American plant bearing larger berries. It is used in tarts, and is cooked with sugar as a dessert.

Crane. [AS.] A long-legged, long necked wading-bird. Cranes are either white or brown, and are without crest plumes on their heads, except the African crowned crane, which has an upright tuft on its head. They are remarkable for their long migrations twice every year, and for their perfect

discipline on these journeys. The Greeks and Romans esteemed the flesh of the crane as a delicacy.

Crane. A machine for lifting and lowering weights, and, while holding them suspended, carrying them a short distance to the side.

Crank. [O.E.] A bent portion of an axle or shaft or an arm keyed at right angles to the end of a shaft, by which motion is directed or received.

Cray′on. [Fr.] A pencil of colored chalk. A pencil of carbon used in producing electric light.

Cream. [Fr.] Cream is milk-fat, and rises above the watery particles of the milk. When cream is examined with a microscope, it is seen to be composed of very small balls of fat, each of which has a skin or covering of curd. By churning, the skin of curd is broken, and the little lumps of fat unite to form the yellow solid called *butter.* (See *Curds*)—*Cold-cream*, an ointment of white wax, almond oil, rose-water, and borax, used as a salve.

Cream of Tartar. An alkaline tartrate, known as the bitartrate of potash. As prepared from argol—a deposit from grape-juice—it is a white crystalline substance, and the crystals, when reduced to powder, form the *cream* of tartar. It dissolves readily in hot water, but sparingly in cold. It is used in medicine.

Cre′matory. Within recent times burning instead of burying dead bodies has come into use to some extent, and is growing in popularity. Crematories or furnaces for this purpose exist in several of our large cities.

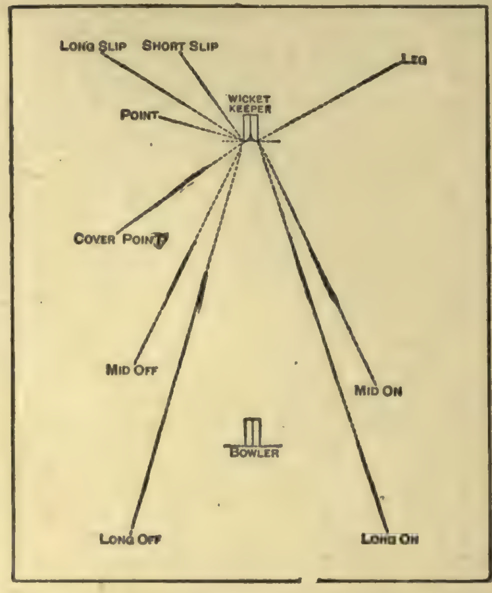
Cream′ery. A factory for the production of butter. Creameries are now widely in use in the United States, their effect being cheapness in production and a better and more uniform quality of butter than that made on the farm.

Cre′osote. One of the substances derived from the tar obtained from the distillation of wood. It differs chemically from the creosote obtained by distilling coal-tar. Wood creosote coagulates albumen, but does not coagulate collodion; which distinguishes it from carbolic acid, the leading product of coal creosote. It has great antiseptic power, hence its name (Gk. *kreas*, flesh; and *sozein*, to preserve). A piece of meat steeped in it does not putrify. Both wood and coal-tar creosote are used as preservatives for timber placed in the ground.

Cress. [AS.] A plant which grows in moist places, used as a salad. The leaves have a pungent taste, and are anti-scorbutic.

Crick′et. [Fr.] An insect with a sharp voice found under the floors of houses in Europe. Whatever is moist they seek for, and they will eat yeast, crumbs, milk, or kitchen refuse. The noise of the cricket is produced by the male. He raises his horny wing-cases and rubs them briskly together. The sound he makes is *cree-cree*, hence his name. In Africa crickets are fed in a kind of iron oven and sold to the natives, who esteem them because their noise lulls to sleep. The field-cricket feeds on herbs that grow at the mouth of its burrows, and in summer they sit there chirping all night and day.

Cricket. [AS. *crook*, a small staff.] A game played with bat and ball and wickets. It is the favorite game in England and the British Colo-



nies. In the colleges and cities of the Eastern States it has become popular. Eleven men make a team. The man with the bat stands in front of the wicket, which is three upright stakes with two short bails or sticks resting on their top, when these are knocked off the player is out. The ball is bowled with an over-hand throw with the purpose of knocking the wicket.

Cro′chet. [Fr.] Knitting by a hooked needle with cotton, worsted, or silk.

Croc′odile. [Gk.] A large and fierce animal found in the Nile and other rivers of Africa, also in Asia and America. It grows to 16 or 18 feet in length. The mouth of the crocodile has no lips to cover its strong teeth, which are firmly set in pits in the jaw, with a new tooth started below the root of each tooth. The fourth tooth in the lower jaw is longer than the other teeth, and when the mouth is closed it reaches up over the upper jaw. The crocodile bird enters its mouth in pursuit of insects which infest its mouth. The hide of the crocodile is tough, and is composed of plates of bone covered with horny scales. Its tail is useful in swimming, and also in the capture of its prey. It strikes large animals with it, and by it holds them under the water till they drown. Its neck is wanting in flexibility, and so it has much difficulty in turning. Its eggs are laid in the sand, and hatched by the heat of the sun. Alligators are like crocodiles, but they are smaller, and their feet are not so completely webbed, and they are found only in American waters.

Cro′cus. [L.] A flower white in color in wild state; cultivated forms are yellow or purple; rising from the bulb, blossoming early in spring. One species, the saffron, blossoms in autumn.

Cross. [Fr., from L.] Two pieces of wood laid one across the other, either simple cross T, or St. Andrew's Cross X, or St. Anthony's Cross T, or the Latin Cross †.

Crow. [AS.] A genus of birds, related to the magpies, nutcrackers, jays, and other forms. The Crows have long, strong, and compressed bills, with the ridge of the mandible more or less curved, and the tip notched; the wings are usually long, the tarsi covered with broad plates, and toes of moderate length. They feed not only on grain and fruit, but on animal substances, and some species on carrion. They all make large nests of sticks, lined with soft hair or down, and lay eggs with dark spots on pale-bluish, green-

CRYSTALS.

ish, or white ground. True crows include the raven, the carrion crow, the hooded crow, and the rook. The rook and jackdaw are gregarious, the rook nesting on trees, and the jackdaw on high buildings, such as church towers. The raven, carrion crow, and hooded crow all feed on carrion, and are fond of eggs, and young birds or rabbits. The American crow resembles the carrion crow, but is smaller, and after the breeding season gathers in large flocks. Its fondness for grain and seeds is an annoyance to the farmer, but it repays him by devouring large numbers of worms and larvæ. It is one of the most intelligent of birds. The fish crow of the United States is very expert in catching river and sea fish.

Crown. [Fr.] An ornamental head-dress for a king or queen. Nobles wear coronets, the pope a triple crown or tiara. The crown of England is a circle of gold with crosses, fleur-de-lis, and imperial arches, enclosing a velvet cap, and set in diamonds and precious stones.

Cru′cible. A vessel or pot for the melting of glass or metals. It is made of some substance which will stand a great heat, usually clay mixed with black-lead, sand, or other refractory substance. For the use of chemists crucibles are made of platinum, silver, porcelain, blacklead.

Crui′ser. In modern navies a cruiser is a ship-of-war, armored or unarmored, designed for cruising, and lighter in armament than the battleship, while higher in speed.

Crys′tals. [Gk.] The term applied in chemistry and mineralogy to those bodies which have assumed a regular geometrical form, in contradistinction to those substances which are amorphous. Although there are numerous varieties of crystalline form, they can all be reduced to six primary systems. These are distinguished from each other by the number and position of the *axes*, which are mathematical straight lines assumed to intersect each other in the centre of the crystal, and to connect the opposite faces of the crystal or its opposite corners. Each substance which crystallizes possesses a definite form, serving as one of the marks to distinguish it from other substances.

Cuck′oo. [O.E.] A climbing and perching bird, about twice the size of a lark, which feeds on caterpillars, grubs, and insects. The cuckoo does not build a nest, but places her eggs in the nests of other birds. Sometimes the birds turn the strange egg out, but oftener the mother bird takes it under her care and hatches it with her own. Though the cuckoo egg is small, the young cuckoo is larger than those young birds in the same nest, and turns all the other young birds out, and often kills them. The tree-cuckoos of America also have this peculiarity. The cuckoo is called "the harbinger of spring," because it comes over the sea when winter is gone, and its cry of "Cuckoo! cuckoo!" seems to say that spring is come. The Arabs think the bird says "Yakub!" hence they call it Yakub's (or Jacob's) bird.

Cu′cumber. [L.] A creeping plant, with fruit of a long and usually curved shape, used for salads, either fresh or pickled.

Curaçoa′. A liqueur or cordial, flavored with orange-peel, cinnamon, and mace; first made at the island of Curaçoa, in the Dutch West Indies.

Curds. [Celt.] The thickened part of milk. If a weak acid be added to milk, solid whitish lumps of *curd* separate from a watery liquid called *whey*. If, instead of a weak acid, an acid fluid obtained by soaking the stomach of a young calf in salt water, which is called *rennet*, is used, it quickly and completely coagulates the curd and separates it from the whey. When curds are analyzed, they are found to be composed of a substance known as *casein*, which contains nitrogen, and is classed with the nitrogenous or flesh-forming food-stuffs.

Cur′lew. [Fr.] A sea-bird which neither swims nor dives, and leaves the shore in summer for the inland country, where it nests and rears its young. In the autumn and winter months flocks of curlews may be seen at the sea-shore feeding on small crabs, shrimps, and worms. The curlew is about two feet in length, and when its wings are spread out they measure three feet from tip to tip. It makes its nest on the ground among dry grass, and lays in it four greenish eggs spotted with brown. It is easily tamed, and is common in Europe, North America, and some parts of Asia.

Cur′rant. [Fr., from Gk. *korinthos.*] A small seedless raisin from Corinth; the fruit of several

shrubs, as common red-currant, white currant, and black currant, used for jams or jellies; also the flowering currant, with showy white, red, or yellow flowers.

Cur′rent, Electric. A quantity of electrical force conveyed along a wire, from an electric machine, a galvanic battery, or a dynamo, and employed for producing sparks, operating motors, etc.

Cut′lery. All kinds of table, hunting, butchers' and cooks' knives and forks; razors, pocket-knives, scissors, and shears. Also surgical, dissecting and dental instruments are sometimes included.

Cut′tle-fish. A form of mollusc, without an external shell, somewhat like the octopus, but with two tentacles longer than the arms and with club-shaped ends and curious suckers. There are also narrow fins at the sides of the body; and the mantle is supported on the inside by a thin plate, which is known as cuttle-fish bone. These are used in bird-cages. They are not like true bone, but are formed of layers like shells, with a hard covering, and the birds peck small particles of lime from them.

Cy′clone. [Gk.] A great storm moving in a circle or spiral, which may be less than 500 or more than 2,000 miles in diameter. It is attended with violent winds and heavy rains, and sometimes does immense damage. The storm moves slowly or rapidly forward. The *Anti-cyclone* is opposite to the cyclone, its winds blowing out from instead of towards a centre.

Cyl′inder. [Gk.] A long, round body, the ends of which are equal circles opposite to each other.

Cym′bal. [Gk.] A musical instrument formed of two metal plates, which are clashed together.

Cy′press. [L.] An evergreen tree, often planted in grave-yards. Its wood is remarkable for great durability, and yields a healing balsam.

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Dace. A small fish of the Carp family, found in clear and quiet streams in Europe. It makes good sport for the angler, and its flesh is preferred to that of the roach, but is not highly esteemed.

Da′do. [Ital. a cube.] The solid part of the pedestal of a statue; the lower part of the wall of a room when ornamented with mouldings or differently from the rest.

Daf′fodil. [Fr.] A kind of lily or narcissus, with a bulbous root and beautiful flowers, usually yellow; called *daffadowndilly*.

Daguerre′otype. The predecessor of the photograph; the method of printing pictures of natural objects discovered by Louis Daguerre, and made known in 1839. The images were impressed on a silver plate, made very sensitive to light by a coating of iodide and bromide of silver. The daguerreotypes were not very permanent, and have been replaced by photographs. (See *Photography*.)

Dah′lia. [Swed. *A. Dahl*, a botanist.] A tuberous plant, with a large and beautiful single or double flower. It is a native of Mexico and Central America; but the cultivated varieties are numerous—more than two thousand—with bright and varied colors. The first roots were carried to Europe by Humboldt in 1790.

Dai′ry. [Scand.] A place for keeping milk and making butter and cheese. A dairy should be lofty, well built, and roofed with slate, the windows covered with gauze wire, the floors and walls overlaid with smooth, polished tiles, and the shelves of slate or marble. It should be cool, dry, clean, and well ventilated, and furnished with pails, coolers, sieves, bowls (either of earthenware or glass), dishes for skimming milk, plunge or barrel churns for making butter, slices, scales, and weights. A system of dairy factories or associated dairies was instituted in the United States in 1860, and has developed so greatly that there are now more than 1000 in the State of New York alone, and the system has been introduced into several countries of Europe. They were at first confined to cheese-making, but many of them now make butter and cheese, and there are numerous creameries (*q.v.*), making butter only.

Dai′sy. [AS., day's eye.] A small wild flower, with a white rim of petals arranged like a star, and a yellow centre. The flower is held in a green cup, on a short, wiry stalk rising from thick green leaves. It grows in fields or by the wayside, and is found low down in the grass. It blooms from early spring to late in autumn, opens when the sun shines and closes at night. *Ox-eye daisy*, or the Daisy of North America, is also called the whiteweed. It is a kind of *chrysanthemum*.

Dam′ask. [Damascus.] Cloth of silk, linen, or wool, with figures woven on it by different directions of thread without change of color, first made at Damascus. Damask is woven with a twill, in which the weft threads skip eight of the warp. In diaper cloth the weft skips five instead of eight.

Dancers, Eastern. Young women of the Eastern countries noted in the dance for their graceful and rhythmic movements.

Dan′delion. [L. *dens leonis*, a lions tooth.] An herb common in Europe and the United States, with large yellow compound flowers, and leaves with jagged or notched edges. The root is mixed with coffee, and is a useful tonic, and the young leaves are used as a salad.

Darwin′ian Theory. The theory of *natural selection*, advanced in 1859 by Charles Darwin, which maintains that all species of animals and plants are derived from older species by a process of survival of the individuals best adapted to the surrounding conditions of nature, and hereditary transmission of their superior structure.

Date. [Fr.] The date palm-tree and its fruit. The fruit is shaped like an olive, is sweet and wholesome, and has a hard kernel. It is the

chief article of food of the natives of Arabia and North Africa, and is their principal source of wealth. The tree rises to a height of 60 feet, with a crown of large feathery leaves and flower-

EASTERN DANCERS.

stalks, and white flowers that are followed by the fruit in bunches. The leaves are used as thatch, the sap by fermentation is made into wine, and the wood is useful for furniture and in building.

Da′vit. [Fr.] A piece of timber used for keeping the anchor clear of the ship's side when being hoisted; *pl.*, arms of iron over a ship's side or stern from which a boat is hung, ready to be let down or to be raised.

Day. [AS.] A word originally used to indicate the period of time during which it was light, in contrast to night or the period of darkness. This usage still exists, but a day in its civil or legal sense, is now the period between midnight and the succeeding midnight, or 24 hours. The siderial day, which is based on a seeming revolution of the stars, instead of the sun, is shorter, being 23 hrs. 56 min. 49 sec. Astronomers reckon the day as beginning at noon, and count the hours from 1 to 24.

Dea′con. A person in the lowest degree of holy orders. In the Roman Catholic Church the deacon acts as an assistant to the priest, and may preach and baptize with the permission of the bishop. In the Church of England he can exercise nearly all priestly functions. In the Presbyterian, Baptist and other Churches the deacon or elder is an officer selected to assist the minister in the direction of religious affairs.

Decant′er. [Fr.] A large glass or bottle for holding liquor free from sediment, from which drinking glasses are filled.

Deck. [Du.] The upper floor or covering of a ship. The name, however, in a large vessel is applied to the berth-deck, where the sailors' hammocks are hung; the gun-deck; half-deck, the part below the spar-deck; hurricane-deck; orlop-deck, where the cables are stowed; poop-deck, with a cabin; quarter-deck, including poop-deck; spar-deck, or upper deck.

Deep Sea Explora′tion. Dredging the ocean depths to discover the conditions there existing. Many expeditions have been sent out for this purpose, the most interesting discovery being the fact that numerous animals, of peculiar forms, inhabit the ocean at great depths, numbers of them being brilliantly phosphorescent, and thus lighting up their dark abode.

Deer. [AS.] A family of ruminating animals, with slender limbs, and large antlers or horns on the head of the male animal. These are solid, and are shed annually in the spring; but new ones grow rapidly and send out branches, so that in a few months the deer has another pair of horns, each year's antlers increasing in size till the seventh year, after which they get smaller. The deer feed on vegetable substances, and they are wont to swallow large quantities without

much chewing, and masticate at their leisure; this they can do because they have a complicated stomach divided into four chambers. (See *Digestion.*) The reindeer is found in the north of Europe and America. It is used for drawing sleds; and its flesh and milk supply the natives with food, and its skin with covering. It eats moss and lichen. The horns of the wapiti, or Canadian red deer, weigh more than 60 pounds. The moose, or elk, is the giant of the Deer tribe. The fallow deer has palmated horns. The musk deer is about 20 inches in height. The musk, from which it is named, is secreted in the abdomen.—*Deer-stalking*, hunting the stag by stealing on it unawares.

Degree′. [Fr.] The 360th part of a circle; 60 geographical miles; the unit of measure for arcs and angles; divided into 60 minutes, and each of these into 60 seconds; also a distinction conferred on graduates of a college or university.

Honorary degrees are conferred on persons of distinction without examination as to their attainments.

Delf. A kind of earthenware made at Delft, in Holland; also any glazed earthenware for table use made in imitation of that.

Denuda′tion. The removal of solid matter by the flow of water in streams, or the action of the waves and currents of the seas. The process is continuous in regions of plentiful rainfall, the surface layers of the earth being gradually carried away to deposit in bays and seas.

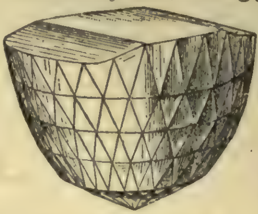
Dev′il-fish or **Oc′topus.** A highly organized mollusc without an external shell, and sometimes of great size. Its head has large staring eyes, and its eight arms or feet have two rows of suckers, which adhere to animals or objects by a curious mouth with two long teeth. Within its body is a sac with an inky fluid, which it throws from a funnel in its mouth when alarmed. This ink is used as sepia, or India ink. The name *devil-fish* is sometimes applied to the *fishing-frog*, and in America to a gigantic species of *ray*, one of which has been found in Delaware Bay weighing 5 tons.

Dew. [AS.] The name given to the drops of water which are seen on the leaves of plants on bright mornings, more especially in the spring and autumn. The air contains aqueous vapor, and the amount of vapor which the air will carry increases as the temperature of the air rises, and diminishes as it falls. When the air contains as much vapor as it is capable of taking up at any particular temperature, it is said to be *saturated;* and when it is cooled below the point of saturation, condensation takes place, and the moisture deposited in this way from the atmosphere is termed *dew*. The temperature at which dew begins to be deposited is termed the *dew-point*. When the sky is clouded, the greater part of the heat radiated by the earth is reflected back from the clouds, and the temperature of the air does not sink to the dew-point. It will be found that on cloudy nights there is no deposition of dew. The air should be still, otherwise no air remains long enough in contact with the ground to be cooled to the dew-point.

Dew′berry. An American species of blackberry, with prostrate stems, abundant in dry, stony fields from Canada to Virginia. Its fruit is of large size and delicious taste, being much superior to the high blackberry. There is a British fruit of the same name, but not nearly so palatable.

Di′al. [L. *dies*, a day.] An instrument constructed to show the hour of the day from the position of the shadow of a style cast by the sun on the face of a dial-plate. It consists of a straight rod or style attached to a plane surface, which is graduated in such a way that the shadow points to the correct time of day as shown by the sun. The style is placed in a direction parallel to the earth's axis. The time shown by a sun-dial is true solar time.

Di′amond. [Fr., from Gk. *adamantos*.] The hardest and next to the ruby the most valuable of gems. Chemically, it is pure, crystallized carbon, its crystalline form belonging to the regular or cubic system, having generally eight or twelve faces. The best diamonds are perfectly clear and colorless, and are described as being of the *first water*. The peculiar lustre of the diamond distinguishes it from all other substances, and the vivid brightness and intense glow of its reflections are unsurpassed by any other stone. It is also distinguished from other gems by its extreme hardness. The value of a diamond is greatly enhanced by cutting. This industry was at one time confined almost exclusively to Amsterdam, but it is now carried on in other places. Diamonds are cut in two forms—the *brilliant* and the *rose* cut. The former brings out better the beauty of the stone. The dust is used by the lapidary and the gem-engraver, and the stone is used for jewelling watches and in cutting glass, and for the latter purpose it must not be cut. Inferior sorts are used by engineers in rock-boring, and by copper-plate engravers as etching-points. Diamonds are found in India and Borneo, and sometimes in North America and Australia; but the chief diamond fields of the present day are those of South Africa and Brazil. They were first discovered in South Africa in 1867, existing there in a blueish earth, from which they are washed out. An immense number of diamonds, of great collective value, have been obtained from these mines. Among the large diamonds found the most famous is the Koh-i-noor, which has a very interesting history. Others are the Great Mogul, the Orloff, the Regent, and the Sancy.



THE ORLOFF DIAMOND.

Di′aper. [Fr., corrupted from Gk. *iaspis*, jasper.] Linen or cotton cloth or towelling, woven with constantly-repeated figures like jasper. (See *Damask*.)

Di′aphragm. [Gk.] A muscle crossing the body, separating the chest from the abdomen, and forming a movable partition between these two cavities, its most important office being connected with the function of respiration.

Di′atoms. The name of a family of minute plants, inhabiting seas and rivers, each consisting of a single organic cell, inclosed in a double case of silica, the two halves fitting together like a box and its lid. They exist in vast multitudes and of many different forms, being visible only under the microscope.

Die. [F.] A stamp, often one of a pair, used in marking coins, in forging metals, and in striking sheet metal. Dies are always made of the finest steel, and the figures on the die are cut by small steel tools. Book-stamps are cut in brass instead of steel.

Digest′ion. [L.] The power of dissolving and distributing food over the body. All vertebrates have a mouth, which is generally furnished with teeth. The food is mostly cut and divided in the mouth and mixed with saliva, after which it is swallowed and digested in the stomach (*q.v.*) by gastric juice, and in the intestines by bile and pancreatic juice, the nutritious portions being absorbed in the blood. In shell-fish, after food is crushed by hard plates in the stomach and mixed with saliva, it passes into a long intestine, where the nutritious parts are absorbed into the blood. Insects pass the food into a crop and then into a gizzard, where it is crushed and passed into the true stomach and intestines.

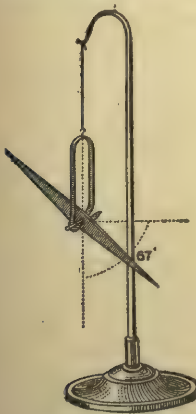
Digita′lis. A genus of plants of which the best known species is the common foxglove, which bears handsome flowers—large, rosy, spotted within with white and purple, and hanging gracefully. The leaves have an acrid, bitter taste, and an overdose of them is poisonous. Employed in small doses, digitalis is a useful medicine, being very useful in diseases of the heart, and in inflammation.

Dike. [AS.] Earth dug out and raised up in a bank; also a wall of turf or stone. In geology, a volcanic rock filling up fissures in the strata.

Dim′ity. [L.] A cotton cloth used for curtains. It is plain or twilled, sometimes in colors.

Diphthe′ria. A very malignant disease of the throat, mainly attacking children, and often fatal. It is a contagious disease, due to the presence of noxious bacteria, and has been successfully treated by inoculation with an antitoxin, or serum, produced by culture of diphtheria germs.

Dip′ping-nee′dle. An instrument for measuring the dip or inclination of the *compass* needle to the horizon, and from this fact it is also termed the *inclination compass.* It consists of a magnetic needle very accurately mounted on a horizontal axis.

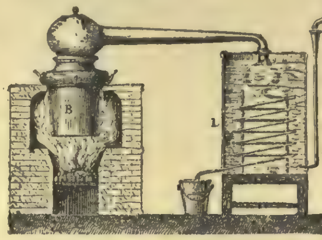


DIPPING NEEDLE.

Disc or **Disk.** [AS., from Gk.] The round surface of a plate or star. In owls, the space around the eyes. A disc engine is a kind of rotary engine.

Disinfect′ant. An agent for destroying the germs of infectious diseases, or for removing by oxidation the organic matter in which germs develop. Some of the substances used for this purpose are sulphurous acid, obtained by burning sulphur, corrosive sublimate (mercuric chloride), chloride of lime, carbolic acid, Condy's fluid, and green vitriol (ferrous sulphate).

Distilla′tion. This process consists in boiling a liquid and condensing the vapor which is formed. The liquid, which we may suppose to be water, is heated in a vessel. The steam or vapor, as soon as it is formed, is made to pass through a coil of pipes, placed in a vessel of cold water.



While passing through this coil, the vapor parts with its heat to the cold water, and on condensing is drawn from the end of the worm. The vessel must be constantly replenished with cold water, and the heated water allowed to run off, otherwise the condensation would soon cease. The object of distillation is generally to free the liquid from any impurities it may contain, and also to separate a more volatile liquid from one less so, such as alcohol from water.

Div′ing-bell. An apparatus in which persons may be let down and remain for a considerable time under water without much inconvenience or danger. It is a large vessel, closed at the top and sides, but open at the bottom. It takes its name from having been originally shaped somewhat like a bell; but it is now generally made square at the top and bottom, the bottom being somewhat larger than the top. The bell is used in blasting rocks under water, in examining the foundations of piers and bridges, and in recovering stores and treasures from sunken vessels. A code of signals has been arranged by which those below can make known their wishes to others stationed at the top. Dresses have now been devised which enable divers to work under water without the aid of a diving-bell. The dress is made of india-rubber cloth, and covers the entire body. The head is covered by a helmet provided with eye-holes covered with strong glass. Air is supplied through a tube which enters the head-piece, and is connected with an air-pump above. A dress of this kind is now much used by those who dive for pearls, sponges, and coral.

Dock. [Du.] An artificial place with gates, for ships being loaded or unloaded. The *dockyard* is the place near the dock where stores for ships are kept. A *dry dock* is one from which the water has been pumped out, and is fitted with appliances for making or repairing ships, and includes graving-dock, floating-dock, and hydraulic dock. A *wet dock* is the name for a dock with water shut in at a fixed level, and opened or shut according to the state of the tide.

Dog. [O.E.] The dog is a carnivorous quadruped, and belongs to the same family as the fox, the wolf, and the jackal. It has long been domesticated, and is the faithful companion of man, having followed him into every part of the world. There are many varieties, which are carefully bred. They include the large and useful Eskimo, Newfoundland, and St. Bernard breeds; the various long and slender hounds, the pointer,

setter, and other hunting dogs; the alert little terrier; the water-loving spaniel; the watchful mastiff; the fine and powerful bull-dog; the highly intelligent collie or sheep-dog, and various others.

Dog′fish. A small shark of many kinds. The European spotted dogfish is abundant; the American dogfish is sometimes called the blue dogfish; the common dogfish, both in America and Europe, is horned.

Dog′star. Sirius, the brightest of the fixed stars in the Canis Major or Greater Dog constellation. The conjunction of the rising of the dogstar with the rising of the sun was thought by the ancients to be the cause of the great heat of summer and the consequent sickness, and the period of six weeks from the middle of July was hence named *dog-days*.

Dog′wood. The American dogwood is a small but very ornamental tree, bearing flowers surrounded with large white bracts, and scarlet berries in winter. The bark is a useful febrifuge. The European dogwood is a shrub whose foliage becomes deep-red in autumn. Its wood is very hard, and is used for skewers, cogs for wheels, etc., and also makes the best charcoal for gunpowder.

Dol′lar. [Sax.] A silver coin of different value in different countries. In the United States the silver dollar weighs 412½ grains. The name is an abbreviation of Joachim's thaler, first coined in 1518 in St. Joachim's Valley, Bohemia.

Dol′phin. [Fr.] A mammal smaller than the true whale, and common in all seas. It is more elegant than the porpoise, and is distinguished by its long snout. Dolphins follow vessels in companies, leaping out of the water and tumbling about. They chase flying-fish relentlessly, and prey on small fish, and often follow them into shallow waters or up rivers. In color the dolphin is black above and white below, but it is said to change its color when dying. Its head is peculiarly shaped—round above and long like a beak.

Dom′ino. [Ital.] A kind of hood worn by the canons of a cathedral; a mask. Also a small piece of wood, bone, or ivory marked by from one to six dots, or blank, for playing the game of dominoes. The game is played by matching the dots.

Dor′mouse. A small rodent animal that sleeps in winter. It lays up a winter store of nuts, and does not bury them, but prefers to hide them in the tree, which serves for a home. It weaves a nest of grass blades, like that of the harvest mouse.

Dove. [AS.] A bird of the genus *Columba*. It is the same as the pigeon, there being no distinction in the terms. The European turtle-dove has a sweet plaintive note; the ring-dove is the largest; the sea-dove is the little auk.

Dove′tail. [O.E.] The ends of two boards fitted into each other by one being cut the shape of a dove's tail. The one is called a tenon, and the other the mortise or socket.

Drag′on. [Fr., from Gk., a serpent.] A fabulous winged serpent; a small tree-lizard or flying-lizard of several kinds found in the East Indies

and Southern Asia. Five or six of the hind ribs on each side are prolonged and covered with a web-like skin, forming a kind of wing. This wing aids it in flying or leaping from tree to tree.

Drag′on-fly. An insect with a large head and great eyes, and a white, scarlet, blue, and green long sharp body, and four strong gossamer-like wings. It preys on flies, gnats, mosquitoes, and butterflies. It lives mostly about water, and lays its eggs in the water, in which the larvæ are hatched. The pupas are not inactive, as in many insects, but are voracious insect-eaters.

Dragoon′. [Span.] A soldier who used to fight either on foot or horseback, with a musket carved with dragons; a horse-soldier with a helmet.

Drain. [AS.] An arrangement of channels for draining off water from houses or fields. House-drains are glazed and water-tight.

Drainage-tubes. A recent appliance used in surgery. The tubes are of india-rubber, perforated with numerous holes, and are introduced into chronic abscesses and large wounds to draw off the pus as formed. In some cases tubes of glass, or of decalcified bones are employed.

Draughts. A game for two persons, each with twelve round pieces of different colors, played on a board marked with black and white squares.

Dredge. [Fr., from Du.] A scoop for bringing up mud from the bottom so as to deepen rivers or docks; also a drag-net to sweep the bottom of streams or seas for other purposes.

Drill. [Du.] An instrument for boring, usually with an edged or pointed end, and cutting by revolving. Diamond drill is a rod set with diamonds for boring rock.

Drom′edary. [Low L.] The African or Arabian camel, which has but one hump. (See *Camel.*)

Dross. [AS.] The impure portion or dregs which sinks to the bottom, or the scum which rises to the top, especially from metals when ore is smelted.

Drug. [Fr., or from *dry.*] Something dried to make a medicine. Applied to medicinal agents used in the treatment of disease, or more generally the crude substances which, after they have undergone preparation, are usually called medicines. To be *drugged* is more particularly applied to those suffering from a narcotic medicine, which produces stupor, and sometimes death.

Drug′get. [Fr.] A coarse cloth dyed of one color, made of wool, to protect carpets.

Drum. [O.E.] A large tube with tight skins over the ends, beaten to accompany music—a kettle-drum has a metallic hemisphere, and a single piece of skin to be beaten; the tympanum or stretched membrane in the inside of the ear; a broad wheel on a revolving shaft, round which a belt is put to drive another wheel.

Dry′ing Machines. Machines for the rapid drying of fabrics or other materials by centrifugal force. They revolve so rapidly that the water is thrown off from the enclosed substance. The centrifugal process is also used as the final stage in sugar production, the sugar being placed in a perforated cage, and the machine whirled round at a speed of 1,000 rotations a minute. This throws off the molasses, and leaves the sugar crystals nearly white. In paper-making machines are fans which drive heated air against the inner surface of the paper, rapidly drying it.

Duck. [O.E.] A well-known swimming-bird, whose boat-shaped body and long neck and web-bed feet adapt it to live in the water. Its body is covered with a thick and close plumage; its coat of down is very thick; and it has a large supply of oil in an oil-gland which keeps its feathers from getting wet. Its flat bill is supplied with rough plates around the edge, which form a good strainer, and so it can pick its food from the mud and water it takes into its mouth. Ducks are kept on farms for the sake of their eggs and their flesh. The feathers are also of use for bedding, those of the eider duck (*q. v.*) being especially soft and fine. River ducks include the common domestic duck, the wood-duck, the mandarin or Chinese duck, and the Muscovy duck, originally of South America. The steamer-duck of South America cannot fly, but swims swiftly.

Dye′ing. [AS.] A process consisting in fixing the color in cloth and other materials by immersing them in a prepared bath containing coloring substances. Dyes are obtained from animals, vegetables, and minerals, the different tints being secured by combining the requisite number of simple coloring substances with one another. In order to render the colors permanent, mordants are used. These consist chiefly of the salts of iron, alumina, and tin. With aniline and some other dyes no mordant is required. Indigo is the chief of blue dye-stuffs; quercitron and fustic dye yellow; and madder, log-wood, cochineal, and aniline dyes are the most common red dyes.

Dynamite [Gk. *dynamis*], or **Giant Powder.** The general name for various explosives, prepared by mixing nitro-glycerine with some absorbing substance which prevents leakage. The materials used for this purpose are sawdust, silicious marl, rotten-stone, tripoli, the meal of Indian corn, sponge plaster, and an infusorial earth known as "keiselguhr." Its explosive powers are very great, while it is far safer to handle than nitro-glycerine. It was discovered in 1867 by Alfred Nobel, a Swedish chemist.

Dynamo. [Gk.] A machine used for generating a current of electricity by the rotation of coils of wire with iron cores between the poles of a powerful electro-magnet. When any conductor of electricity is moved about in the space surrounding the poles of a magnet so as to cut the lines of force at right angles, currents of electricity are produced in the conductor. In magneto-electric machines permanent magnets are used; but when an electro-magnet is substituted for the permanent magnet, the machines are termed "dynamos," or dynamo-electric machines. Dynamos are used for electric lighting; also to operate electric motors on cars and in factories to drive machinery—the motor being simply a reversed dynamo.

E

Ea′gle. [Fr., from L. *aquila.*] A large vertebrate bird of prey of the Falcon family, with a short, sharp, hooked beak; short, strong feet; very strong, sharp, hooked claws (*q.v.*); and a long tail. It has keen vision, is solitary in its habits, and builds its nest usually on the top of a lofty tree in a swamp, or on some rocky peak, of large sticks and branches heaped together. It uses the same nest year after year. It feeds on birds, squirrels, hares and rabbits, and lambs from the flock, seizing its prey, not with the beak, but with the talons (*q.v.*), sometimes driving its breast-bone straight against what it wishes to kill. The most noted species are the golden eagle, the imperial eagle, the American white or bald eagle, and the European sea-eagle. The golden eagle is a fine large bird. Its nest is roughly made up, and often measures five feet square. The young eagles never number more than four, and are hatched in thirty days. This bird, on perceiving its game, circles in the air, and then slowly descends in decreasing circles till the prey is caught. The bald or white eagle is about the size of a small hen turkey. Its head is not really bald, but covered with thick, white feathers, which give it this appearance. Its feathers are of a brownish-black color. It loves fish, but does not catch them itself. Instead, it watches the fish-hawk or osprey at its work, and when it sees that the hawk has caught a fish, it swoops downward and forces it to yield its prey.

The eagle was the emblem of ancient Rome, and is now the emblem of the Austrian and Russian empires, and of the United States. The

Austrian and Russian eagles are made with two heads, in imitation of the double-headed eagle first used by Constantine the Great, one of the heads of which meant the Western Empire, and the other the Eastern Empire.

Eagle, a gold coin of the United States, whose value is ten dollars. It was first coined in 1795. The half eagle was first made in the same year, the quarter eagle in 1796, and the double eagle in 1849. These coins are not pure gold. The eagle was named from the emblem of the United States.

Ear. [AS.] The mechanism through which sound reaches the brain. In man and the higher vertebrates the ear is divided into three parts—the outer opening, or meatus; the middle ear, or tympanum or drum; the inner ear, or labyrinth. The membranous labyrinth consists of a number of sacs and tubes containing a lymph fluid, which fills a cavity known as the bony labyrinth. The sound collected by the outer ear sets the tympanic membrane vibrating; the bones in the middle ear convey these vibrations to the inner ear, where the fibres of the auditory nerve receive them and send them to the brain. A passage called the eustachian tube opens from the inner cavity into the throat. When through cold the throat is swollen, the mouth of this tube may close and deafness ensue. The ears of animals of prey bend forward to collect the sounds in the direction of the pursuit. The ears of animals of flight, as hares and deer, turn backward to catch the sounds that may warn them of approaching danger.

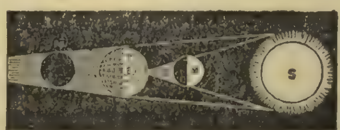
Earth. [AS.] One of the planets of the solar system, coming next to Mercury and Venus in the order of distance from the sun. The principal motions of the earth are (1) its daily revolution on its axis; (2) its yearly revolution in its orbit round the sun. It was long believed that the earth stood still and the sun, planets, and stars revolved around it, but astronomers have proved that the earth moves round the sun, completing one revolution in about 365 days 6 hours. The orbit is an ellipse, with the sun in one focus, so that the earth is not at the same distance from the sun at all periods of the year; the mean distance is about 92,800,000 miles. The motion of the earth in its orbit explains the apparent motion of the sun in the heavens during the course of the year. Many general considerations suggest to us the globular form of the earth. When a ship is sailing away from the land, the hull will be seen to disappear while the masts are still visible, and by degrees the masts also sink below the horizon. If the sea were flat, the body of the vessel would be visible as long as the masts. Mariners also have sailed round the earth, always steering in the same general direction. Measurements made at different parts of the earth's surface show that the length of a degree increases towards the poles, and that consequently the earth is not a perfect sphere, but is flattened at the poles. Its mean diameter is 7,918 miles, and circumference 24,875 miles, while it moves around the sun at a speed of 15 miles per second. The mass of the earth is rather more than five times as great as that of a globe of water of the same size would be. It has been found that the temperature increases about 1° F. for every 64 feet of descent. If the temperature were to increase at this rate inwards, then at no great depth the heat would be sufficient to melt the ordinary materials of the crust known to us. Hot springs and volcanoes show that the interior of the earth is much warmer than the exterior. It is therefore supposed that, though the materials in the interior are at an exceedingly high temperature, yet owing to the great pressure under which they exist they are most probably in the solid state.

Earth'quake. A movement or shaking of some part of the surface of the earth, resulting from a shock inflicted on a solid portion of the earth at some point below the surface. Earthquakes occur with most frequency in volcanic regions. A few of the more remarkable earthquakes of modern times were those of Lisbon in 1755, Lima in 1746, Peru and Ecuador in 1868, and the Riviera in 1887.

Eb'ony. [Fr., from Heb.] A kind of wood, usually black, hard, and heavy, which can take on a fine polish. The finest is the heart wood of a tree found in Mauritius. Other trees in Ceylon and the East Indies also yield ebony. A leguminous tree in the West Indies yields green ebony. It is used for ornamental cabinet work, mosaic, flutes, knife handles, pianoforte keys, etc. Most of the furniture called ebony is made of cherry-wood dyed black.

Eccen'tric. [Fr., from Gk.] A wheel or revolving disk, whose axis of motion is not in its centre. By its use circular motion can be converted into intermittent motion. Eccentrics are used to work the valve-gear of steam-engines and for many other purposes.

Ech'o. [Gk.] A sound reflected back to the ear. It is caused by the sending back from a reflecting surface of the undulations which produce the sound. The most remarkable echoes are one at Lurlei on the Rhine; those at the Whispering Galleries at St. Paul's, London, the Observatory, Paris, and the Capitol, Washington, and those on some of the lochs in Scotland. (See *Focus.*)



ECLIPSE OF THE SUN.

Eclip'ses. [Gk. *ekleipsis*, a failing.] When a body which does not allow light to pass through it (an opaque body) is exposed to the light of

the sun or of any other luminous body it casts a shadow behind. *An eclipse of the moon* is caused by the moon entering the shadow of the earth; which can only happen at the time of full moon, when the earth lies directly between the sun and moon. *An eclipse of the sun* takes place when the moon, coming between the earth and the sun, intercepts the sun's light. This can only happen at the time of new moon, when the moon comes directly between the sun and the earth. Usually the moon hides the whole disc of the sun, producing a *total eclipse*; but occasionally a thin band of sunlight is visible round the edge of the moon, and then we have what is known as an *annular eclipse* (*annulus*, a ring). This is because the moon is not always at the same distance from the earth when the eclipse happens, and at its greatest distance the apparent size of the moon is less than that of the sun. If the moon is a little out of the central line between the earth and sun a *partial eclipse* is produced.

Eel. [AS.] A kind of fish with a strong smooth skin, a vast quantity of small scales, and a long thin body. Though it has the head of a fish it has no gill covers, but only a small hole. Its dorsal and anal fins run along nearly one-third of the body, but some species are nearly destitute of fins and have no scales. Eels mostly abound in waters which communicate with the sea and some species live only in sea-waters. The fresh-water eel can creep over the ground like snakes, and sometimes passes the winter in a torpid state in mud. It has transparent horny coverings to defend its eyes from mud and stones. Eels are the terror of most other fish, and attack their prey by day and by night. The murry eel abounds in the Mediterranean and other warm seas, and the Romans esteemed it a delicacy. Eels are caught by eel-bucks, eel-sets or nets, and bobs or worms and worsted. *Electric eels* are found at the mouth of the Orinoco in pools after a flood, where they are harpooned by the natives, who drive wild horses into the water to receive their electric shocks. These eels are large, yellow, and livid, and arch their bodies, straightening themselves with a jerk, and curving back again when they produce the shock. The shock is severe enough to knock down men or animals. The electricity is generated by cells in the lower part of the body, and the number of cells varies according to the size of the fish.

Egg. [AS.] A roundish or oval-shaped body laid by birds and other animals, and from which their young come forth. The egg of the bird consists of a yolk with a germ-cell, which is surrounded by white albumen and enclosed in a shell. The germ-cell occupies little space, but it is of great importance, since from it the bird develops. Twisted cords of albumen allow the yolk to roll over when the egg is turned, but the germ-cell always keeps uppermost, and so is always nearest the body of the bird as she sits on her eggs, and thus receives the most heat. In growth the albumen furnishes the matter for the body of the young bird, and the yolk affords its nourishment. The bigger the yolk the larger will be the young chicken. There is at the top of the egg a little bubble of air for the use of the young bird, and fresh supplies of air pass through numerous small pores in the shell. The young bird, when sufficiently grown, chips the shell by a little knob on its beak; which disappears after it has come forth from the shell. An ostrich egg will weigh three pounds, and contain as much as one dozen hens' eggs. Ostrich eggs are left in the sun to hatch. Alligators place theirs under a mass of vegetable matter heaped up on purpose to produce the heat necessary for hatching. Turtles lay from 100 to 200 eggs, and cover them with sand, carefully smoothing the place where they are left to hatch in the heat of the sun. The female shark lays but two eggs, which are enclosed in leathery purse-shaped cases, with the four corners lengthened into tendrils, and these becoming entangled in sea-weed hold the egg in its place. The empty black cases of sharks' eggs are often found on the sea-shore. The eggs of fishes are tiny, covered with a thin skin, and so transparent that the fish can be seen moving inside for a day or two before being hatched. A single cod-roe will contain 9,000,000 eggs, but great myriads of fish are devoured when young by their larger neighbors. The eggs of frogs are scattered through a lump of thick jelly, which sticks to grass or twigs, and so is prevented from drifting away by that which affords food to the young animals. Many snakes lay eggs, which like those of the frog are stuck together by a thin jelly. Snails deposit tiny white eggs, which contain perfect little snail-shells within. The eggs of ants are scarcely visible. The queen ant lays all the eggs, which are immediately taken in charge by nurses that lick and clean them till little white grubs are hatched. The queen bee lays all the eggs of bees, sometimes 2,000 in a single day, and each egg is placed in its own special cell—worker eggs in worker-cells, and drone eggs in drone cells. After a few days the eggs hatch white grubs, which are attended by nurses. Nearly all spiders enclose their eggs in a silken cocoon, which, in some species, the mother carries on her back: 2,000 young spiders have been found in one cocoon. The eggs of domestic fowls are very nutritious.

Ei′der Duck. [Scand.] A sea-bird, which spends the winter on the Arctic seas, and when spring comes swims with its mates to the shore. The female makes a large, loose nest of dry grass, and lines it with a thick layer of down plucked from her own breast. The natives rob the nests of this down, and when it is replaced rob them a second time. Then the male bird strips himself of his down to line the nest, which is now left undisturbed. The female lays from six to ten pale-green eggs. Eider down is valuable for its softness and lightness, and the eggs are much liked as food. The eider duck does not fly well, but is early taught to swim and dive, the mother going down to the sea with a little one under each wing.

El′der. [AS.] A small tree or shrub with soft pith, white flowers, and black, red, or purple berries.

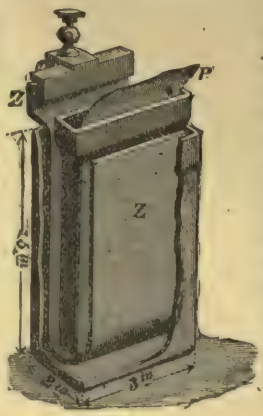
The berries are diaphoretic and aperient. Elder-flower water, made from the flowers, is a perfumed water used in perfumery and confectionery.

Electric′ity. [Gk.] This name was originally applied to certain attractions and repulsions, but the subject has gradually widened so as to include various chemical heating, luminous, magnetic, and mechanical effects. Electricity is considered under the two heads of (1) Statical or Frictional Electricity; and (2) Current or Voltaic Electricity.

Diagram Showing: A, four cells in series; B, four cells in parallel; and C, three in series with two in parallel.

Statical Electricity. As early as 600 B.C., Thales and other Greek philosophers discovered that amber (hence the name electricity, from Gk. *electron*, amber) when rubbed with silk attracted light bodies; and about 1600 A.D., Dr. Gilbert found that glass, sulphur, sealing wax, resin, and many other bodies were possessed of the same property. When glass is rubbed with silk, the glass is said to be electrified *positively*, and the silk, which has been the rubber, *negatively;* but wax rubbed with silk or flannel is *negatively* and the silk *positively* electrified. The existence of two kinds of electricity is shown as follows: A small pith ball is hung by a silk thread from a glass support, forming an electric pendulum. When a glass rod which has been rubbed with silk is brought near the pith ball, the ball is attracted by the glass; but as soon as it touches it, repulsion follows, and the two separate. If now a stick of sealing-wax be rubbed with silk, and brought up to the pith ball, the latter will be attracted towards the wax although it has just been repelled by the glass. This shows that a pith ball touched by electrified glass is afterwards repelled by the electrified glass, but attracted by electrified sealing-wax. This experiment shows two things: (1) that there are two kinds of electricity; (2) that two bodies charged with like electricities repel one another, and those charged with unlike electricities attract. The electricities here called positive and negative are also known respectively as *vitreous* and *resinous*. The electricity produced by friction has great electro-motive force, and is thus capable of overcoming great resistance, and of producing powerful mechanical effects; but it is deficient in quantity, and therefore does not possess a large amount of energy.

Current Electricity. A galvanic or voltaic cell or battery is an arrangement in which electricity is yielded by chemical action. Such electricity is named *current*, because it is continuous while the chemical action lasts, and not intermittent, like the momentary discharge from a Leyden jar. A current may also be generated by heating the junction of two dissimilar metals; the electricity obtained in this way is called the thermo-electric current, the heat being transformed into electricity. Another method of obtaining a current is by rotating a coil of wire between the poles of a magnet or of an electro-magnet, as in the dynamo which yields electric light and power. The chief subjects which require to be considered under the head of Current Electricity are (1) the effect of the current in producing chemical decompositions; (2) in producing heat and light, as in electric lighting (*q.v.*); (3) the production of induced currents by the action of anohter current or of a magnet; (4) the measurement of the strength of the current, as with the galvanometer. (See *Galvanometer*, *Ether*.)



GROVE'S CELL.

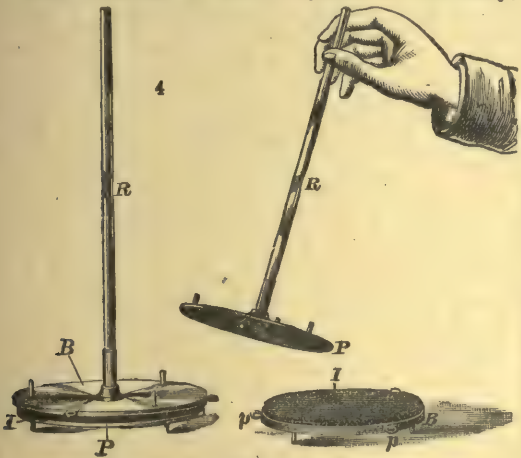
Z, zinc plate in dilute sulphuric acid; P, platinum plate in strong nitric acid.

Elec′tric Light. Two forms of electric light are used—the *arc* and the *incandescent*. When a strong current passes between two carbon points which have been first in contact and are afterwards separated a short distance, the interval between them is occupied by a luminous band (known as the voltaic arc). This constitutes the *arc* light. Its light is very intense. The common street light is equal to about 800 candle-power, but the powerful search light may equal more than 50,000,000 candles. In the *incandescent* lamp the current is made to pass through a strip of carbon which has been carefully prepared and formed into a loop. This becomes intensely hot, and gives out much light. It is enclosed in a small glass globe, from which the air must be removed or a vacuum formed, otherwise the heated carbon would unite with the oxygen and the air be consumed. This light is suitable for household use. The current is supplied by an electro-magnetic machine.

Elec′tric Tele′graph. A system of conveying intelligence to a distance by means of signals produced by aid of the electric current. The two stations, which may be several thousand miles apart, are connected by a wire along which the electricity flows. The electric current, produced by a galvanic battery, passes along the wire with immense velocity, and is capable of acting upon an electro-magnet at great distances. In the common Morse system the sender uses a small

instrument, by tapping which with his finger he can break off the current at will. When this is done quickly the receiving instrument gives a quick sound, or makes a dot on paper. When slowly, there is a longer sound, or a dash on paper. These dots and dashes are variously combined to represent the letters of the alphabet. These are now caught by the ear, paper not being used. Telegraph lines are usually carried through the air on wooden poles, galvanized iron being used. Telegraphs also pass under the oceans, their wires being surrounded by insulating material, the whole being called a cable. Telegraphing without wires has recently been invented.

Elec′tro-met′allurgy. The art of depositing metals—such as gold, silver, copper, etc.,—from their solutions by a slow current of electricity,



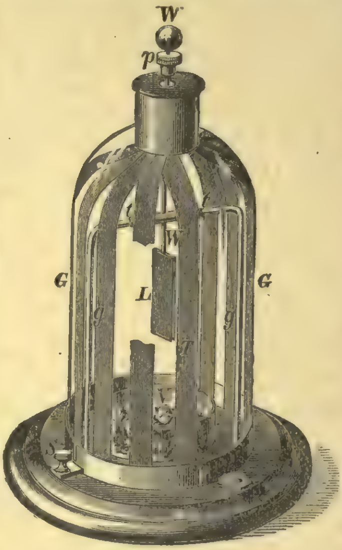
ELECTROPHOROUS.
I, Ebonite plate; B and P, upper and lower plates of brass; R, insulating handle for upper plate.

obtained either from a voltaic or a magneto-electric battery. The process is mostly confined to electro-typing and electro-plating.—*Electro-typing* is the method of securing copies of medals, statuettes, etc. When copper, for example, has to be deposited upon a mould (made of plaster of Paris or gutta-percha), the mould is made a conductor by brushing it over with black-lead; and, after attaching it to the negative pole of the battery, it is suspended in the solution of sulphate of copper, the positive pole consisting of a plate of the same metal. By the electrolysis of the solution copper is deposited on the surface of the mould, while sulphuric acid is set free; and this, by dissolving a portion of the copper at the positive pole, keeps the solution at constant strength.—*Electro-plating* is the process of covering forks, spoons, etc., made of the cheaper metals, with a coating of silver. The process is in reality electro-typing in silver instead of copper. The solution of silver (called the bath) consists of two parts of cyanide of silver, 10 of cyanide of potasssium, and 250 of water. By the electrolysis of this solution silver is deposited on the object which is placed in it.

Electroph′orous. An apparatus for generating frictional or statical electricity. By striking or rubbing the ebonite with dry flannel and then placing thereupon the upper plate of metal and touching the upper and lower metal disks simultaneously, upon removing upper disk a discharge of electricity will be then felt upon touching the upper disk.

Electrom′eter. An instrument for measuring the force or power of an electric current.

Elec′troscope. An instrument for measuring or detecting pressure of electric current. By rubbing a glass rod with a piece of silk and touching the knob *W*, the strips of gold leaf will part indicating pressure of electricity.

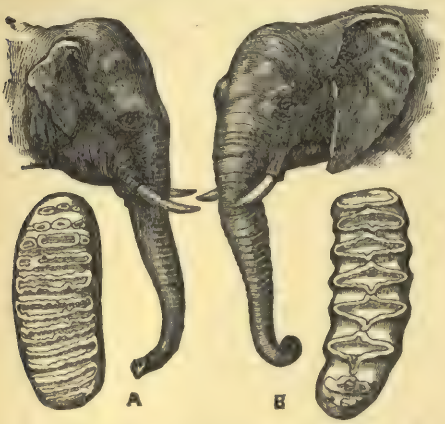


GOLD-LEAF ELECTROSCOPE.
G G, Glass shade; L, gold leaves supported by wire w; gg, glass supports for w; v, vessel containing sulphuric acid; p, small plug to be pressed down when instrument is not in use.

El′ements. [L.] Substances which cannot be decomposed by chemical action, and which seem to be unit forms of matter, as distinguished from compounds. They are roughly divided into two great classes—the metals, and the non-metals or metalloids. The number of elements now known is about 75, but some of these may not be simple bodies, but compounds of simpler bodies.

El′ephant. [Heb. *aleph*, an ox.] The largest and most powerful of four-footed animals. It is clumsy and thick-skinned, but has a lithe and agile trunk. Some elephants have been found 12 feet high and over five tons in weight. They can carry great burdens at a ate of two or three miles an hour. Their legs are massive, but they can kneel and rise easily, and can use their fore feet as hands in holding down branches while the leaves are being stripped off by their trunks. The feet of the elephant are divided into toes, though externally gathered into a round cushion mass, protected by flattish nails. Compared with its body, its head is small, and the skull contains many hollow spaces, which lessen its weight. It has pendulous ears, gigantic tusks in the male, and a trunk which can reach 8 or 10 feet. The tusks, which are the incisor teeth of the upper jaw, are weapons of defence or forks to dig up roots. The eye is small but brilliant, and its inability to look backward or upward is made up for by great acuteness of hearing. The

trunk, which is the nose lengthened out, is of a tapering form, and is composed of thousands of minute muscles, which give it great power in feeling and grasping, or in pumping up or ejecting water. The trunk conveys the food to the mouth or draws up water which is thrown over the back. The elephant is herbivorous, and feeds on grass, young shoots, and roots; it is found in Central and Southern Africa, and in India. Elephants are captured by enclosing them in palisades



of timber. They are intelligent and sagacious, and can be trained to do many kinds of work and many feats. The African elephant has great flapping ears, and is more fierce than that of Asia. Its tusks yield fine ivory, which is very valuable. The Asiatic elephant is smaller than the African. The tamed elephants in menageries are of the Asiatic kind.

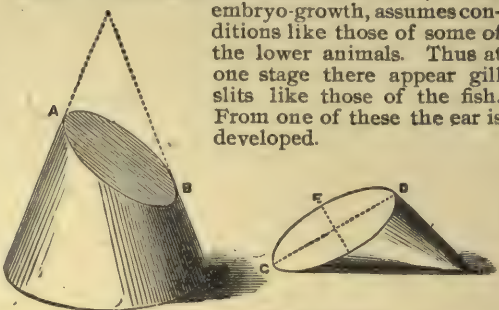
El′evator. [L.] A machine for raising grain, etc., to a higher floor—usually an endless chain with a series of scoops or buckets; also, a cage or platform or hoist for hoisting persons or goods. The passenger elevator is largely employed in the lofty buildings of recent times. By its aid buildings many stories high are easily used. It is called a *lift* in England.

Elk. [Scand.] A large species of deer. The European elk has long, flat horns, and is closely allied to the moose. The American elk is known as the wapiti, and is of large size, being about as large as the horse. Its horns are the finest of all deer horns, being 5 or 6 feet long, and having many branches.

Ellipse′. [Gk.] A curve of such form that every point on it has the sum of its distances from two fixed points always the same. The two points are called the foci. The orbits of the planets are ellipses, with the sun in one focus.

Elm. [AS.] A large and graceful forest tree with thick foliage of dark-green leaves. It has smooth bark on the branches, but a rugged trunk. Its flowers are dark red, and bear an oval green pod with one seed. This tree is often planted in rows in parks, and is very common in England. Its wood is hard and tough, and used for water-wheels, building, shipbuilding, carving, etc. Its bark is used in tanning, dyeing, and sugar-refining. The American elm is called white elm; a red elm, called slippery elm, has a succulent inner bark, whose jelley-like juice is used in medicine.

Embryol′ogy. The science of the development of the animal body from the germ to the mature state. It has been discovered that man, in the embryo-growth, assumes conditions like those of some of the lower animals. Thus at one stage there appear gill slits like those of the fish. From one of these the ear is developed.



CONE CUT TO SHOW THE ELLIPSE.

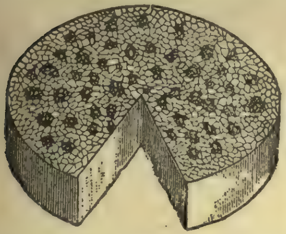
Em′erald. [Fr., from Gk.] A variety of the mineral beryl, of a beautiful green color; when transparent it is much prized as a gem. The finest stones come from Colombia, in South America, and fine ones are found in Peru. Inferior emeralds come from Bavaria, India, and Mt. Zalvra, in Upper Egypt. Large crystals of emerald occur in North Carolina and Siberia.

Em′ery. [Gk. *sman*, to rub.] A variety of corundum, occurring in grains or powder, and very hard. It is glued on cloth, paper, or the rim of a wheel, and used for grinding and polishing hard substances. It is found in the island of Naxos, in the Grecian Archipelago, and other places.

E′mu or **E′meu.** [Port.] An Australian bird related to the cassowary and ostrich, and, next to the ostrich, the largest of birds. It cannot fly, but runs swiftly. The emu kicks backward or sideways, while the ostrich kicks forward. Emu feathers are scarcely distinguishable from ordinary hair. The male bird hatches and broods the young. In its wild state it feeds on parrots or other birds; but it is often made a household pet, though mischievous and cunning. It is the only running bird that wanders in pairs. Its eggs are of a beautiful dark-green color.

Enam′el. [Fr., from Ital.] In pottery, a substance of a vitreous nature applied as a coating to the surface of pottery or porcelain. It is a fusible kind of glass, and is either transparent or opaque, and when transparent it forms a glaze. An enamel of a similar kind is used as a lining for the inside of iron vessels used in cooking. In the fine arts it is a substance applied as a coating for decorative purposes on the surface of porcelain or metal.—*Enamel work*. In this kind of work the chief decorative quality lies in the manner of its execution. There are distinct classes of it, as *Cloisonnee*, *Champleve*, *translucent*, and *surface* enamel.

En'dogen. [Gk.] A plant that grows by adding new wood to the interior of the stem, as a palm, rush, or orchid. Opposed to exogen (*q.v.*). The leaves have usually parallel veins, and their flowers are in three or multiples of three parts. Endogens have no bark, because, the flow of sap being internal, bark is not required to defend the sap, as in exogens. The Endogens include palms, lilies, orchids, etc.



En'gine. [Fr., from L. *ingenium.*] A machine fitted to do work or set machinery in motion. There are various kinds—steam-engine, air-engine, fire-engine, pumping engine, and donkey-engine. Military engineering includes the designing and building of fortifications; civil engineering includes the building of railways, canals, waterworks, bridges, lighthouses, docks, and tunnels; mining engineering has regard to the sinking and working of mines; electrical engineering includes all kinds of electrical work.

En'signs. [L. *insignis.*] The flags of a regiment, usually two, and referred to as colors. In America they are carried by color-sergeants. The rank of ensign, formerly used in the British army, was abolished in 1871.

Ep'aulet. [Fr., from L. *spatula.*] A mark of an officer, naval or military, worn on the shoulder, formerly used.

Ep'som Salts. The ordinary name for sulphate of magnesium; so called because it occurs in a spring at Epsom in Surrey, from the water of which it was originally prepared. It is now manufactured from mountain limestone, the lime being separated by sulphuric acid. It is found native in America, and may be also prepared from sea-brine. It is used in medicine as a purgative. It has a bitter, saline, disagreeable taste, which may be somewhat relieved by adding a little lemon syrup.

Er'mine. [Fr.] An animal like a weasel, having a thick, valuable fur, worn by judges and royalty as emblem of authority. In summer it is brown, but in winter it is white. The tail is always black; and these tails are arranged at intervals through the fur when worn in state robes. It is named from Armenia, where it was first found; but now it is found in the north of Asia, Europe, and America.

Escape ment. [Fr.] The means in a clock or watch by which the force of the weights or spring is checked and regulated by the motion of the pendulum, or balance acting on a wheel with sharp teeth. They are known as the verge or upright, the anchor-shaped, the cylinder, the duplex, and the lever.

Es'sence. [L. *essentia*, being.] The volatile matter forming a perfume. Essential oils, extracted from various plants, fruits, and flowers are used in essences and perfumery.

Etch'ing. [Du.] A picture made from an etched plate, chiefly copper. In etching, the plate is covered or dabbed with a varnish, and is scored or scratched with a needle, so as to form the drawing; it is then covered with nitric acid and water, which bites the metal in the lines laid bare.

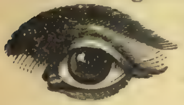
E'ther. [Gk. upper air.] A medium of extreme tenuity, which is assumed to pervade all space, and the interstices between the molecules of all bodies, whether solid, liquid, or gaseous. It is the medium by means of which light, heat, electricity, and magnetism are transmitted, it being claimed that diffused matter cannot convey these forces, and that a very rare substance, differing in character, is needed. Sulphuric ether is obtained by distilling strong alcohol and sulphuric acid, and is an exceedingly volatile and inflamable body, dissolving fats, resins, and oils, and useful in removing grease stains. It is also used as an anæsthetic.

Eucalyp'tus. [Gk.] An Australian evergreen tree like the myrtle, which grows to a great height, and yields resins, oils, tars, and tannin. The leaves are rigid, with one edge turned to the zenith. They are called *gum-trees*. The timber is valuable. The Tasmanian cider-tree is a eucalyptus, and yields a cider-like sap in spring. A eucalyptus tree in Cape Otway Range, Australia, is 415 feet high. These trees have been widely transplanted and are thought to be of value in malarious districts, as in the Roman Campagna.

Ex'ogen. [Gk.] A plant that grows by adding its new wood round the outside of the stem, under the bark, as is done by most forest trees of the temperate zones. The leaves are usually netted-veined, and the number of cotyledons is two, or very rarely several in a whorl. Exogens and endogens are the principal classes of the vegetable (*q.v.*) kingdom.

Eye. [AS.] The human eye is a nearly spherical ball, which in an adult is about nine-tenths of an inch in diameter. The external coating, known in common language as the white of the eye, is a tough, horny membrane, having about four-fifths of its circumference opaque, and named the *sclerotica*. The front portion of this coating, called the *cornea*, is transparent and more curved than the sclerotica. Behind the cornea is a flat circular membrane called the *iris*. It is colored, and at its centre there is a circular opening called the *pupil*, which is capable of becoming contracted or enlarged on exposure to light or darkness. The color of the iris gives the characteristic color to each person's eyes. Behind the pupil is the *crystalline* lens. The cavity between the cornea and the crystalline lens is called the *anterior chamber*, and contains the *aqueous humor*. The cavity behind the crystalline lens, called the *posterior chamber*, contains the *vitreous humor*.

The sclerotica is lined by a dark-colored membrane called the *choroid coat*, saturated with a black mucus. The choroid is lined with a membrane called the *retina*, which is traversed by a system of nerve filaments coming from the optic nerve. Light falling on the retina produces the



sensation of vision, and this is the only part of the eye which possesses this property. When the rays of light from an object enter the eye, they undergo refraction at the cornea and the crystalline lens, and come to a focus on the retina; if the image formed on the retina is distinct, the object is seen clearly. The eye can accommodate itself so as to be able to see objects at different distances; this is supposed to be brought about by a change in the focal length of the crystalline lens. The prawn has a pair of gleaming eyes standing out upon short stalks, which are composed of a number of six-sided facets in the shape of a hemisphere, by which the prawn keeps a sharp look-out. The snail also has eyes set on long stalks. Bees, butterflies, beetles, ants, flies, house-crickets, and other insects, have compound eyes. The eye of the grasshopper often consists of 12,000 lenses, with a glass-like cone and thread-like rods forming the image. Many of the molluscs and other low forms of life have eyes.

F

Fakir′. A member of an order of penitents or mendicants of Oriental lands, particularly India. Some of them live in communities, others wander about, making unpleasant displays of self-torture and mortification and of filthy habits. The term has recently been applied to itinerant street salesmen.

Fair′y. A fay; an imaginary being of tiny human form, supposed to dance in meadows, steal infants, and play a variety of pranks. They are regarded as sometimes benevolent, sometimes malicious, and to concern themselves greatly with human affairs. The popular belief in fairies has largely died out, but has left a literature of ceaseless charm to the young and imaginative.

Fahr′enheit. A method of marking thermometers (*q.v.*) so called from the inventor, *G. D. Fahrenheit*. Its freezing-point is 32°, and boiling-point 212°. This thermometer is in common use in England and in the United States.

Faith-Cure. A system in which it is claimed that the sick can be cured without medicine, needing only faith in certain persons or objects to produce this effect. Christian Science and some other systems seem based on a similar principle.

Fal′con. [L. *falx*, a reaping-hook.] A bird of prey with claws like a hook. This bird used to be trained to catch other birds for hunters. Eagles, buzzards, and hawks, and most birds of prey, belong to the class of Falcons. All have the same tearing beak—a tooth-like lobe on the upper mandible—and all the same hooked claws. They lay from two to four eggs in the year. The peregrine falcon or hawking falcon is a trim, brave bird. Hawking with the falcon is still practiced in Persia and India. The gyrfalcon is an Arctic bird.

Fall′ing Stars. The flashing meteors which dart across the sky at night and quickly disappear. At certain periods of the year they are seen in large numbers, and yield the impression of stars falling from their place in the heavens.

Fal′low Deer. [AS.] A deer of a fallow or pale yellowish-brown color, smaller than the red deer. In summer both sexes are spotted with white. It is a native of Persia, but is now domesticated in Europe.

Fan. [AS., from L.] An instrument for blowing away chaff, or for moving the air to cause coolness, or to blow a fire. Ladies' French fans are made of ivory, mother-of-pearl, tortoise-shell, bone, gauze, or feathers. Cheap fans from India and China are palm leaves or split bamboo. Large machine fans, moved by steam power, are used for many purposes, and electric fans to cool large rooms in summer.

Fari′na. [L. *farina*, meal.] Ground corn or fine meal made from cereal grains or from the starch extracted from vegetables, and used in cookery. —*Farinaceous food*, food consisting of meal or flour.

Fat. [AS.] The soft, oily part of an animal's body. Carbonaceous foods act both to yield animal heat and to form fat, which is of use to the animal in protecting it from the cold and forming a store of food. Some fats are *solid* at ordinary temperatures. These include beef suet from the ox, mutton suet from the sheep, lard from the pig, butter from milk, dripping (melted fat from meat). They become liquid when heated, and are chiefly composed of stearin. Liquid fats are commonly called oils, and include olive oil, cod-liver oil, etc. Oils (*q.v.*) are composed of olein, and contain less hydrogen than solid fats. Fat is lighter than water, and is insoluble in water. Benzole or benzene will dissolve fat, and is much used to remove grease spots from clothing.

Fea′ther. [AS.] A stalk of horn, hollow at the lower end or quill and filled with pith, and fringed at the other end, forming part of a bird's wing or the covering of its body. Birds are the only animals that are clothed with feathers, and much of their beauty is due to the colors and markings of the feathers. Feathers grow from little sacs in the skin, and are horny and of much the same substance as the scales of reptiles. Soft downy feathers, which overlap one another, form the warm covering of the body. The large quill feathers of the tail and wings are useful for flying. On each side of the quill are barbs, which, cleaving closely to their neighbors by hooks or barbules, make up the web or vane. Lower barbs of a feather and downy feathers have no hooks

on them. The tail feathers of the ostrich and other such birds also have no hooks. Birds always preen or trim their feathers with oil taken from an oil-gland at the end of the tail. This oil is most abundant in water-birds, and makes their feathers waterproof. Partridges and

FEATHERS.
a, d shaft; *b*, aftershaft; *c*, barbs or web.

scratching birds have dingy feathers like the ground on which they live; pheasants and brilliantly-colored birds blend with the bright flowers and pretty fruits upon which they feed. The feathers of various birds form an important article of commerce. Feathers are useful as articles of trimming and ornament, and for the stuffing of beds and pillows. The quills of feathers were formerly made into pens, but the extensive manufacture of steel pens has supplied their place. Feathers for ornament are obtained from the ostrich, marabout, peacock, pheasant, bird of paradise, heron, osprey, and other birds.

Felt. [O.E.] Cloth made of the shortest fibres of wool, or of wool and fur of hares and rabbits, not woven but mixed with thin glue, and rolled or pressed together. After being switched up into fluff by *bowing*, it is carded and twisted into a soft, loose cloth, which is wound on a roller and carried to a felting machine, and then dyed. Fine felt is used for hats and coarser felt for table cloths, carpets, roofing, lining buildings to prevent dampness, and many other purposes.

Fermenta′tion. [L. *fermentatio.*] A change which many organic liquids are capable of undergoing in the presence of certain substances termed *ferments*. The decompositions which take place are different from ordinary chemical actions, and the resulting products vary with the nature of the fermented body and with the kind of ferment used. There are two distinct kinds of ferments—(1) *organized*, and (2) *non-organized*, or soluble ferments. The former consist of minute vegetable organisms. One is yeast, which gives rise to the alcoholic fermentation, producing chiefly alcohol and carbonic acid; another, called bacterium lactis—a rod-like form—is the cause of the fermentation in milk, or lactic fermentation, the chief product of which is lactic acid; a third produces acetous fermentation, giving rise to acetic acid, and there are many others.

Fern. [AS.] An order of plants belonging to the class of *acrogens*. They are usually found in moist soil, sometimes they grow as parasites on trees, and in the tropics reach so large a size as to be called tree ferns. The brake or bracken, polypody, asplenium, maidenhair, are all well-known ferns. They bear clustered cells filled with spores, which germinate and form minute growths, on which are borne the true organs of reproduction. These spores are generally produced in rows on the back of the leaves, or *fronds*, as they are usually called; or sometimes on a central branch or spike. There are more than two thousand kinds of ferns in the world.

Fer′ret. [Fr.] An animal of the weasel kind about 14 inches long, used for hunting rats and rabbits out of their holes. It is like the weasel in form, has red eyes, and its fur is of a light brown, pale yellow, or white color. When used for rabbit-hunting its muzzle or jaws are tied together; and as it cannot bite the rabbits, they are driven to the entrance of their burrows, where they are netted or shot. The ferret in winter must be protected from the cold. It is a native of Africa, but has been domesticated in Europe.

Fe′ver. [Fr.] An illness causing great heat in the body and quick action of the heart. Remittent fevers subside at intervals; intermittent fevers entirely cease at intervals; continued fevers neither abate nor intermit.

Fi′bre. [Fr., from L. *fibra*, a thread.] The thread-like parts in the flesh of animals; also those in the stalks of such plants as hemp, flax, agave, jute, cotton, etc., from which thread, string, rope, and paper are made; also the hairs and wool of animals, the thread of the silkworm, and other substances used in weaving, etc.

Fi′brin. A substance which separates in a solid state from blood after it leaves the body. It is a white, stringy substance, which may be readily obtained by stirring newly-shed blood. It is tasteless, insoluble in water, but is readily digestible in gastric and pancreatic juice, and when dried forms a heavy mass resembling albumen.

Fife. A small wind instrument used with the drum for military music. It is a short tube closed at one end, with holes in the side. It is very ancient, having been used by the old Greeks,

Fig. [Fr., from L. *ficus*, a fig-tree.] A small fruit-tree of from 12 to 20 feet high, with large leaves. The fig is a native of Syria, and grows wild on the Mediterranean coast. It bears two crops annually, and when the fruit is picked it is spread out to dry. Fig-cake is used in the East instead of bread.

File. [AS,] A piece of steel made rough for smoothing wood or metal. A file differs from a rasp in having the furrows made by straight cuts of a chisel, either single or crossed, while the

FIGS.

rasp has coarse single teeth. There are many shapes — flat, square, knife-edged, half-round, rat-tail or round, three-square, cross, and slitting.

Fil′igree. [Span.] Fine thread-like work of arabesque pattern, made of gold or silver wire or wire used in decorating gold or silver. It is made mostly in India, Turkey, Italy, and Malta.

Fil′ter. [From root of *Felt*.] Any substance, as charcoal, sand, or felt, through which liquid passes, and by which it is cleared of foreign substances. Filters are much used for obtaining pure drinking water, and are employed on a large scale in purifying the water-supply of cities.

Fine Arts. The arts designed to appeal to the artistic taste and give pleasure to observers, as distinguished from the useful arts, designed to benefit mankind. They are usually restricted to the arts of painting, sculpture, and architecture.

Fins. [AS., from root of L. *penna*, a feather.] The parts of a fish by which it balances itself and moves forward in the water. The paired fins on the opposite sides of the body are the true limbs of the fish. Those near the gills behind the head are the pectoral fins, and represent the fore limbs of quadrupeds; those below are the ventral fins, and represent the hind limbs; those on the back are dorsal or first and second dorsal; those underneath near the tail are the anal fins, and the tail itself is the caudal fin. These are used as its means of motion and the tail also serves as a rudder.

Finch. [AS.] The name of a family of song-birds, as chaffinch, goldfinch, bullfinch. Many of the finches are beautiful singers, and others are prized for their delicate flesh. They frequent fields, groves, hedgerows, etc., and feed chiefly on grain and seeds. The common sparrow, an European bird now abundant in the United States, is the true type of the Finch tribe.

Fir. [AS.] The name of several kinds of coniferous trees, producing valuable timber or resin. Firs, such as the balsam fir, the silver fir, and the red fir, are large in size and elegant in shape, and belong to the genus *Abies*. The silver fir on the Pacific coast grows to a height of 200 feet.

Fire-engine. A machine by means of which water can be thrown to a great height for the purpose of extinguishing fires. The principle of its action is the same as that of the force-pump (*q.v.*); but in a force-pump the stream of water is intermittent, flowing only at each descent of the piston. This is obviated in the fire-engine by employing a strong air-vessel, into which the water is forced, the compressed air reacting on the water so as to keep up a steady flow. In the force-pump there is only one cylinder, but in the fire-engine there are two, in which the pistons are worked simultaneously, one ascending while the other descends. Fire-engines were formerly worked by hand, but now steam fire-engines are widely employed.

Fire′fly. A small insect which gives out a bright light in the dark. All glowworms are called fireflies or firebeetles, but the American firefly, which generally sparkles in humid districts, is called Photinus, and both sexes are winged.

Fire′works. Preparations of gunpowder, sulphur, metallic filings, and salts, to be set on fire. The most common form of firework is a pasteboard tube filled with these explosive materials. A number of these tubes are often arranged so as to make, when kindled, a great variety of figures in fire variously colored. Stars are made of nitrate of strontia and gunpowder. Rockets are used in war and as ship signals, as well as in pyrotechnic displays. The life-saving rocket consists of a drawn steel tube with a composition that expels the gases with a pressure of 60 tons to the square inch. It is used to carry a rope to a wrecked vessel near the coast.

Fish. [AS.] A vertebrate animal covered with scales that lives almost entirely in water, has no lungs, and breathes through gills. It lays eggs, and, having a heart with only two chambers, its

THE GLOBE FISH.

blood is cold or of the temperature of the air. All the seas and rivers abound in fish. The true fishes include the *teleostei*, or ordinary bony fishes; the *Ganoidei*, as the sturgeon; the *Dipnoi*, or air-breathing fish, of which there are a few species; the *Selachians*, or sharks and skates. Fishes are usually covered with scales

(*q.v.*), which overlap each other, and are moistened with a kind of slime. Many of them are of beautiful colors—gold, silver, and copper tints, and attractive shades of blue, green, red, and black. Fishes swim chiefly with the tail, and their fins (*q.v.*) help them to keep their upright position in the water. They are rich in nitrogenous material, chiefly albumen and fibrin. Some fishes—as salmon, herring, mackerel, and eels—also contain much oily matter, which makes them not so digestible as whiting, sole, etc. Among the fishes most useful as food for man are the cod, salmon, mackerel, pilchard, and herring.

Fish-culture. A method now widely adopted of planting the eggs of fish and guarding the young against their enemies. In this way many millions of young fish are raised and placed in the streams annually. The United States Fish Commission thus distributes over 250,000,000 young fish every year. The same principle is also applied to the lobster, the oyster, and other food animals.

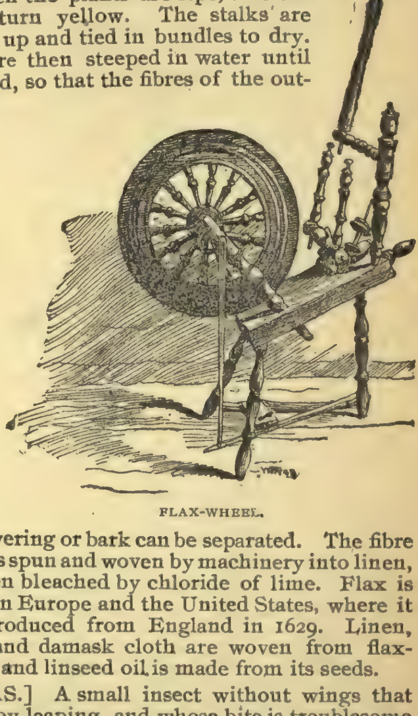
Fish′hawk. The American fishhawk or osprey is found over nearly the whole country. It is a large bird, looking much like the eagle, some of them measuring over five feet across the wings. It lives on fish, darting into the water to seize them. It is often robbed by the bald eagle, which forces it to drop the fish and then swoops down and seizes it in its fall.

Flag. [Scand. to hang loosely.] That which flies or flutters loosely in the wind, but more especially a banner bearing a device or devices, and used to indicate nationality or to give information. *Flag of truce* is a white flag exhibited to an enemy to invite a conference. *Yellow flag* is the quarantine flag, and at the fore of a ship indicates that infectious disease is on board.

Flame. [Fr., from L.] The illumination given by burning gas. Heat is produced by the chemical action which takes place during combustion, the temperature of the burning material being raised sufficiently high to give out light or to produce flame. The structure of flame can be most easily observed in a candle, lamp, or ordinary gas flame. When a gas flame is lit, it is seen that the part nearest to the burner is only feebly luminous. This consists of the gas which has just escaped from the pipe, and, though to some extent heated, has not begun to unite with the oxygen of the air. As the gas rises higher, it comes into contact with oxygen and unites with it. At first the hydrogen of the gas unites more rapidly with oxygen than the carbon, and in consequence a number of particles of carbon are set free, which, on becoming intensely heated, give rise to a bright flame. The illuminating power of the flame is due to the particles of glowing carbon, which, as they rise higher, are consumed on the border of the flame in contact with the atmosphere. In order to give out much light, a flame should contain solid matter; but the most luminous flames are not necessarily the hottest.

Flamin′go. A wading-bird of several species. It is of a brilliant red, and has a long neck and legs. In feeding, the head is bent downward and inward so as to reverse the position of the upper mandible. The nest is made of mud scratched up two or three feet high, and two eggs are hatched, the bird standing so as to rest on the tall nest. The red flamingo posts sentinels, which give warning of danger with trumpet notes.

Flax. [AS.] A plant about two or three feet in height, with small pointed leaves and blue flowers. The stems are hollow, and covered with fibrous material. The flowers grow in clusters at the top of the stalks, and are succeeded by round seed-vessels the size of a pea. Each seed vessel contains ten flat seeds of a brown color. It thrives in a rich, moist soil. The leaves drop off when the plants are ripe, and the stems turn yellow. The stalks are pulled up and tied in bundles to dry. They are then steeped in water until softened, so that the fibres of the outside covering or bark can be separated. The fibre of flax is spun and woven by machinery into linen, and then bleached by chloride of lime. Flax is grown in Europe and the United States, where it was introduced from England in 1629. Linen, lawn, and damask cloth are woven from flax-thread, and linseed oil is made from its seeds.



FLAX-WHEEL.

Flea. [AS.] A small insect without wings that moves by leaping, and whose bite is troublesome because slightly poisonous. The human-flea is abundant in Europe, but rare in America, where the dog-flea takes its place. The dog-flea infests dogs and cats, and is occasionally troublesome to man.

Flints. [AS., a hard stone.] Amorphous lumps of dark silica which occur in nodular sheets in chalk and other limestones. They often enclose such organisms as shells and sea-urchins; spicules of sponges abound in flint. The process by which flint has been formed is uncertain; but it is supposed to be due either to the abstraction of silica from sea-water by sponges, or to the decomposition of animal remains. *Flint-glass* is dispersive of light, and consists of silicate of lead and potassium. It is used for table-ware, and prisms, and is called crystal glass.

Floun′der. [Du.] A flat fish found near the mouths of rivers. There are many different kinds both in Europe and America.

Flour. [Fr., from L. *flos*, flower.] The finest part of meal or corn ground into fine powder. In milling, meal is separated into flour and bran, the meal being afterwards separated from the bran by *bolting* through a gauze-covered revolving cylinder. There are various kinds of flour, some fine, others coarse, and of different grains, as wheat, rye, etc.

Flow′er. [Fr., from L. *flos*, flower.] The part of a plant destined to produce seed. The flower is easily seen in such plants as the rose and the buttercup in which it is large and brightly colored; but grasses, too, and indeed all plants of a higher order have well developed flowers. In a buttercup, on the outside of each flower, are small greenish-yellow *sepals*, five in number, which form the *calyx*. Then come five large bright-yellow *petals*, forming what is called the *corolla*. Inside this, looking like little pins with yellow heads, are the *stamens*. In the centre of the flower are some green bodies called *carpels*, which together form the portion of the flower called the *pistil*. Every part of the flower has its use. The calyx protected the flower when it was a bud. The corolla attracts the insect to the flower. The stamens form pollen, which when placed on the pistil causes the carpels to swell and form seeds. The pollen is carried from the stamen of one flower to the pistil of another by insects. Flowers also contain nectar. It is the wind which carries the pollen of grasses and several other plants. (See *Fruit*.)

Flu′id. [Fr., from L. *fluidus*, flowing.] A substance whose particles possess perfect freedom of motion among themselves, so that any force applied to it will, if not resisted, produce a change of shape. There are two classes of fluids —*liquids* and *gases*—and each class has some properties peculiar to itself.

Fluo′rine. [L.] A non-metallic element, never met with in nature in the uncombined state. It is the only element which does not combine with oxygen. It is most frequently found combined with calcium in the mineral fluor-spar. In minute proportions it is widely diffused in the waters of some springs, rivers, and the sea, and in the bones of animals. Combined with hydrogen it is used in etching glass.

Flu′or-spar. A mineral found in veins, very often accompanying lead ore. It occurs both crystallized and massive. The crystals belong to the cubic system, and are either colorless, green, purple, or yellow. When heated it becomes phosphorescent. It is used as a flux, and some varieties are employed for ornamental vessels.

Flute, [Fr., from L. *flare*, to blow.] A light wind-instrument played by the mouth on a lateral hole, and by the fingers, which stop holes along its length or open keys.

Fly. [AS.] A name applied to many of the winged insects, but scientifically restricted to the sub-order *Diptera*, which have two wings and whose mouth-parts are converted into a sucker, used for taking up fluids. The sucker acts as a lancet, by which the skin of animals and vegetables is pierced so as to reach the blood or sap. The flies comprise many thousands of species, differing greatly in size, the best known being the common house-fly.

FLY'S FOOT MAGNIFIED.

Flying-fish. A fish that can leap into the air with a spring of its tail, and keep itself up by its fins for a time as if flying. Its pectoral fins are developed so as to act like wings. It can fly for hundreds of yards, and is frequently attacked by sea-birds and dolphins (*q.v.*). It has a bladder that can be inflated to fill the whole cavity of the abdomen; it has also a membrane that is inflated through the gills. The California flying-fish is said to fly for nearly a quarter of a mile, usually not rising more than four feet. There are several kinds, which are found in tropical seas.

Fly-wheel. A contrivance for regulating the driving power of a machine. In the steam-engine the power of the connecting rod to turn the crank varies with their relative position. When the rod is at right angles to the crank its turning effect is greatest, and when they are in the same straight line this power is *nil*. There is thus introduced a cause of unevenness in the motion through the whole length of the stroke. To obviate this difficulty the *fly-wheel* is fixed on the axis. This is a large wheel with a heavy rim, which, when once started, requires little work to keep it in motion; but, since it possesses much energy in consequence of its motion, it acts to make uniform the motion of the rod and crank.

Fog. [Celt.] When the vapor in the air reaches the point of saturation (see *Dew*) it condenses, and assumes the form of very small drops, which constitute *fog* if they are present in the lower regions of the atmosphere, and *cloud* if in the higher. Fogs are therefore of the same nature as clouds (*q.v.*). Fogs may be caused by the flow of a current of warm moist air over masses of ice, such as are sometimes encountered in the Atlantic, and are often seen on the Banks of Newfoundland.

Fog Signals. Signals to prevent the collision of vessels in foggy weather. Many methods of signalling have been tried, the best being the whistle and the trumpet. The most powerful is the siren trumpet, whose sound can be heard for more than 20 miles.

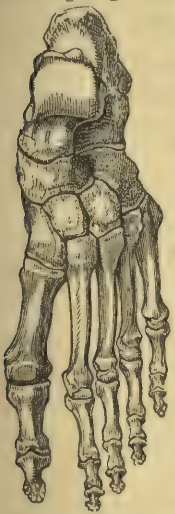
Folk-lore. The study of ancient legends, rustic tales, superstitions, etc. This term has been used since 1846, and great collections of the beliefs, customs, and popular tales handed down from the far past have been made.

Food. [AS.] All substances used for purposes of nutrition. The useful constituents of all foods—animal, vegetable, and mineral—are classified as (1) nitrogenous, including the animal and vegetable albuminoids and gelatin; (2) fatty, including animal and vegetable fats and oils; (3) carbohydrates, including starch and the sugars; (4) salts

organic and inorganic; (5) water. In addition to the vegetable and animal foods consumed for the support and growth of the body, there are also needed lime, iron, soda, potash, chlorides and phosphates, etc. Water is very necessary, since it forms two-thirds of the weight of the body. A very great variety of foods and combinations of nutritive materials are used by man.

Fools'cap. A size of paper 16 by 13, which used to have as its water-mark a *fool's cap and bells*.

Foot. [AS.] That part of the body on which animals stand and walk. There are 26 bones in the foot and ankles of man. To these are fastened a great number of ligaments and muscles, by which their movements are guided and varied. The foot of the chimpanzee is in many points like that of man, but the toes are longer, and it is not adapted for easy standing or walking. The feet of quadrupeds differ greatly. Some have five toes like man, some four or three, and in many cases—as in the oxen, deer, antelopes, camels, and others—there are only two toes, covered with horny hoofs. The horse has but one toe, covered with a strong hoof, which is really the nail greatly developed. What is called the knee in four-footed animals is usually the heel, lifted above the ground. Some animals walk, like man, on the flat sole of the foot; some, like lions and cats, on the bent toes; others, like the horse and ox, on the tip of the toe, which is covered by the hoof. Birds have usually four toes, three in front and one behind, the foot and toes differing as they are intended for perching, walking, wading, or swimming.



CLIMBING FOOT.

FOOT OF SCRATCHER.

TOE WITH SPUR.

FOOT OF PARROT.

Football. A game of kicking a ball with the foot between goals. The ball is usually made of India-rubber or a bladder, and is enclosed in a leather cover.

Foot-rule. A measure of a foot, or 12 inches, in length. It differs in length in different countries. In Britain and the United Stales it is .3048 metre.

Force-pump. A pump having a solid piston for drawing or forcing liquids like water through the valves. The force-pump delivers the water a considerable height above the pump. It is useful in draining cellars or low level places, and in fire-engines.

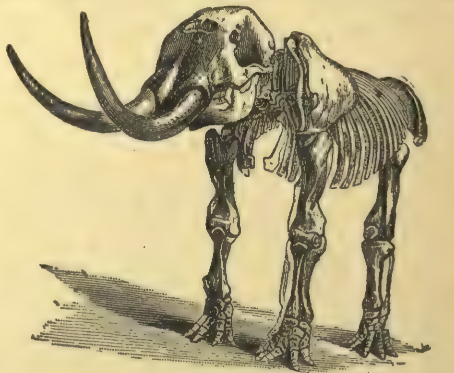
Fore'castle. [Pronounced by sailors *foksl.*] An upper deck before the foremast in a war-ship, which formerly had a turret near the prow or the front part of the ships where are the sailors' berths.

For'est. [Fr., from L. *foris*, out of doors.] A large piece of country covered with trees, or an unenclosed, uncultivated land on which wild animals are hunted. Forest-tree is a tree of the forest, grown for its timber, as distinguished from a fruit-tree.

Forge. [Fr.] The furnace in which a smith heats the iron to be hammered. A portable forge is a light and compact blacksmith's forge, with bellows, etc., that may be moved from place to place. In large forges steam-hammers are used, and the metal is moved by cranes.

Forget'-me-not. A small plant of the genus *Myosotis*, with blue flowers, used as a sign of friendship and fidelity.

For'mic Acid. [L. *formica*, ant.] A sharp acid occurring naturally in ants, nettles, etc., and produced artificially in several ways. It is the first member of the fatty acids in the paraffin series, and is similar in character to acetic acid.



AMERICAN MASTODON, FOSSIL.

Fort. [Fr., from L. *fortis*, strong.] A stronghold. Usually a small fortified place, occupied by troops, and surrounded with a ditch, rampart, and parapet, or with palisades or stockades.

Fos'silized Trees. In many localities collections of tree trunks converted into stone have been found. There are several of these in the United States, there being a remarkable ancient forest in Arizona, whose trees have been converted into opal or agate, with beautifully variegated colors. Some of them are six feet in diameter.

Fos'sils. [Fr., from L. *fossus*, dug.] Hardened remains of animals or plants found in rocks which have been dug out of the earth. Most fossils belong to extinct species, but many of the later ones belong to species still living. The geological strata comprise three main divisions:—the Primary, the Secondary, and the Tertiary; each of these including a number of minor divisions. In the Primary division we find corals, crustaceans, molluscs, fishes, and a few reptiles, and also an abundant flora of herbs and trees of the lower orders, found in the Carboniferous period. The Secondary age had its herbs and plants, its corals, its crustaceans, its molluscs, and its fishes; but the leading animals of this age were its huge reptiles of sea and land. It was peculiarly an age of egg-bearing animals, winged and wingless. The first birds now appeared, with teeth in their jaws, also small marsupial mammals. In the Tertiary period the mammals were wonderfully developed in size and numbers. Its mammoths and its mastodons, its rhinoceri and hippopotami, its enormous dinotherium and colossal megatherium were much larger and more numerous than the largest of existing mammals. The fossil remains of one of its elephants are still so abundant amid the frozen wastes of Siberia, that what have been not inappropriately termed "ivory quarries" have been wrought amid their bones for more than a hundred years. The western section of the United States is exceedingly rich in fossils of the Secondary and Tertiary periods, and new forms are found there annually, some of them of huge dimensions.

Fowl. [AS.] A farm-yard bird used as food, as cock or hen, turkey or duck. Hens feed on grain and seeds, and also worms, flies and beetles. Farm-yard cocks and hens are a mixture of breeds. Game fowls are smaller, and have more delicate legs. Dorkings were first raised at Dorking, England, and are large birds and good layers. Spanish birds are large, with glossy black feathers. Cochin-Chinas are clumsy in shape, and usually reddish-brown, white, gray, or silver gray. Black-breasted Malays and Shanghais are large birds. Hamburgs or grays are silvery white and black speckled. Bantams are very small and courageous. Black and white Houdans are French fowls, and white Leghorns are Italian. The points of a fowl are the neck and saddle hackles, the wing coverts, tail, comb, earlobe, wattles, breast, thighs, and legs.

Fox. [AS.] A carnivorous wild animal belonging to the Dog tribe, famous for its cunning. It has a fine coat of reddish-brown fur, low forehead, ears pointed, and wide at the base, and a splendid bushy tail of the same color, tipped, like its breast, with white. The fox is very mischievous, and usually lives in holes on the borders of a farm, which it visits by night. Its food is poultry, game, rabbits, but also frogs, mice, and insects. It is fond of berries and fruits, grapes and honey. Fox-hunting is a popular sport in Britain, fox-hounds being kept to scent and chase the animal, which leaves a strong odor. It tries to deceive the dogs, and passes over a marsh, or through a thicket, or jumps up a fence or tree, to break the scent. The skin of the fox is very useful; that of the Arctic fox being much valued. This animal changes the color of its skin several times during the year, and in winter is white. The skin of the silver or black fox of North America is most valuable. The common foxes of Europe and America are very similar. Fox-brush is the tail of a fox. Fox-terrier is one of a peculiar breed of terriers, used in hunting to drive foxes from their holes. There are rough and smooth haired varieties.

Fox'-glove. [AS.] A large plant with beautiful purple or white bell-like flowers, spotted inside. The common European plant is a handsome perennial or biennial, whose leaves are so useful in medicine, chiefly as a sedative in heart disease.

Franc. [Fr.] A coin used in France worth a little less than 20 cents. It has been used as the unit of French coinage since 1795. It is divided into one hundred centimes.

Freez'ing Mixture. When a substance changes from the solid to the liquid, or from the liquid to the gaseous state, heat is required to effect the change; and when heat is not supplied from without to produce the change, the body itself, and everything in contact with it, becomes colder. This is the principle of freezing mixtures. When ice and salt are mixed, the salt (from its tendency to absorb and dissolve in water) will cause the ice to melt. But ice in melting uses up a large quantity of heat, and the result is (since the heat has in this case been withdrawn from the substances themselves) that the mixture is rendered very cold, and water poured into a test-tube and placed in it will freeze. In practice, freezing mixtures are used for producing artificial ice in moderate quantities, and in freezing creams, etc.

Freez'ing-point. That degree of a thermometer at which a fluid begins to freeze. Applied to water, the freezing-point is 32° F. and zero or 0° C. Mercury freezes at 39°F. below zero.

Fret'work. Work adorned with figures cut out by a fine saw. Fillets intersecting each other at right angles are classic designs, and those at

oblique angles are often based on Oriental art. Fret-saw or scroll-saw has a long, narrow blade.

Fric′tion. [L.] The rubbing of one body against another. It may be caused by a sliding motion or a rolling motion. Friction clutch or coupling is an engaging or disengaging gear for revolving shafts, pulleys, etc.; they being so pressed together as to revolve in company. Friction-wheel transmits motion by surface friction instead of by teeth.

Frieze. [Fr.] Coarse woolen cloth with a nap on one side, used for outer garments; also the flat band between the cornice and the architrave of a pillar, usually covered with carving.

Frig′ate. A ship of war having two gun-decks, and carrying from 20 to 50 guns; classed between a sloop-of-war and a line-of-battle ship. The term frigate has nearly disappeared, being replaced by *cruiser* in naval terminology.

Frig′ate Bird. [Fr.] A web-footed bird, called also man-of-war bird or frigate-pelican. Its beak and wings are long, and its power of flying very great. It feeds on fish, which it takes from gulls, terns, and other birds.

Fringe. [Fr.] A border or edge of loose threads of wool, silk, or linen; originally consisting of the ends of the warp projecting beyond the woven fabric, but now made separately and sewed on.

Frog. [AS.] A small vertebrate animal, with a broad, squat body without a tail, that lives both on land and water. It has a smooth, slimy skin of a greenish-brown or reddish color; it has teeth on the upper jaw, and by this is distinguished from the toad, which has no teeth. Its tongue is soft and fleshy, and fixed on the front of the mouth, but free behind, so that it can roll out and catch an insect. The tip of the tongue is always covered with a treacly, glutinous matter, to which any insect caught adheres. The frog flings its food down its throat with a very rapid motion. As with the rabbit, its fore limbs are less used than the hind limbs, and so are shorter and smaller. The hind legs are long, and support the swimming web. It has four fingers in front and five toes behind. Frogs breathe slowly, and their blood is of a low temperature. The food of frogs is insects, snails, worms, and they swallow their food whole. Frogs cannot breathe in water, and so live much on land; but water is needed to keep their bodies moist. They lay their eggs at the bottom of the water. The eggs are laid in a kind of jelly, which fastens them to a stick or plant in the water. After about a month the eggs hatch, when there appear small tadpoles, with head and tail and a pair of shoulders behind the mouth, and with gills for breathing. As they grow the gills and tails are lost and the frog develops. Of frogs, the tree-frog, the pond frog, and the bull-frog are the most familiar. Frogs are found all over the world, and are eaten as food in many places.

Frost. [AS.] When the temperature falls below 32° F., all superficial moisture changes into ice, and we have frost. Frost is one of the agents which play an important part in moulding the surface of the land, as it causes rocks to decay, and breaks up the materials of the soil. When rain falls it sinks into the pores of rocks, and soaks into the soil; and this moisture, in changing into ice, expands and pushes the particles of the rocks or of the soil more widely apart. Ten cubic feet of water give 11 cubic feet of ice. When a thaw sets in, the surface of the rock is loosened, and crumbles into soil, or is washed away by rivers to the sea, and the materials of the soil are broken up and rendered more fit to be made use of by plants. Black frost is where the cold turns vegetation black without hoar or white-frost.

Fruit. [Fr., from L. *fructus.*] The matured seed vessel and its contents. Thus the ears are the fruit of the corn plant, nuts are the fruit of the hazel tree, pods the fruit of the bean or pea, and the

THE BANANA.

acorn the fruit of the oak. In the apple, orange, etc., the seeds are imbedded in a soft, juicy, fleshy substance; in dry fruits, such as nuts, the seed or kernel is surrounded by a hard shell; in drupaceous or stone fruit, as peaches, the fruits are stony within and fleshy without. *Small fruits* include currants, gooseberries, raspberries, strawberries, etc.

Fun′gus. [L.] An order of soft plants, including truffles, toadstools, and mushrooms. More particularly the growth on an animal or plant caused by decay or disease, as mildew. Some kinds of fungi are used for food. Lichens are now believed to be fungi existing as partners with algæ.

Fur. [Fr.] The fine hairy covering of certain animals found in cold regions. In the hairy covering of the cat two kinds of hair grow—one short, soft, silky, and barbed lengthwise, which is the *fur;* and longer smooth hair, which is called the *overhair.* The best-known fur-bearing

animals are the seal, beaver, sable, fox, mink, marten, otter, ermine, and musk-rat. After the skins have been removed from the animals, and before they are cleaned, they are called pelts. Fur forms the chief clothing of the inhabitants of Arctic regions, and in temperate regions is also used for trimmings or for outdoor garments. In seal-skins for ladies' jackets the overhair is usually removed. The furs of the rabbit, hare, and beaver are used to make felt.

Fur′nace. [Fr., from L. *fornax*, oven.] A close fireplace for melting metals, baking bricks, etc. In air or wind furnaces the fire is urged by the natural draught; in a blast-furnace a forcible current of air is thrown into the fire; in a reverberating furnace the flame, in passing to the chimney, is thrown down by a low arched roof on the materials in the furnace.

Fur′niture. [Fr.] Things supplied or needed for any purpose, as sails, tools, and fittings, and more particularly the articles needed to fit a house for being lived in. Certain articles, as kitchen-ranges, cupboards, shelves, and blinds are called fixtures. In printing, the furniture consists of pieces of wood or metal, lower than the type, placed round the pages or form to secure the type in its place.

Fuse or **Fusee′.** [L. *fusus*, poured.] A tube filled with explosives, used for firing mines, etc. Fusee also means a match for lighting a pipe or cigar.

Fusee′. [L. *fusus*, spindle.] The cone-like wheel in a watch for the chain to be rolled on, in such a manner that the diameter of the wheel at the point where the chain acts may correspond with the degree of tension of the mainspring.

Fu′sel-oil. [Ger.] An acid volatile oil obtained in the manufacture of potato brandy and whiskey. Its chief constituent is amyl alcohol. It has a powerful and suffocating odor, and is supposed to be a product of the fermentation of sugar. It is an undesirable ingredient in alcohol.

G

Gad′fly. [O.E. *gad*, sting.] An insect that deposits its young in the nostrils of sheep; a species infests cattle, depositing its eggs on the skin and causing sores; another kind produces intestinal parasites in horses.

Gai′ter. [Fr.] A covering of cloth or leather for the ankle and the instep, or for the leg from the knee to the instep, fitting down on the boot or shoe.

Gal′axy. The Milky Way, or zone of milky light which is seen in the sky on clear nights, and is made up of millions of stars. The term is also used for any assemblage of splendid things or persons, as a *galaxy* of beauty.

Gale′na [L.], or **Sulphide of Lead,** occurs native, and constitutes the chief ore from which most of the lead of commerce is obtained. (See *Lead.*) It possesses a bright bluish-white metallic lustre. It is sometimes found in Transition rocks, but more frequently in the Secondary rocks, especially in compact limestone. It occurs in beds and veins, and is found in almost every country. It is very abundant in Britain and in the United States. It is prepared artificially by adding sulphuric acid to a soluble lead salt.

Gall. [AS.] A fluid of a greenish-yellow color, and very bitter, found in the gall-bladder beneath the liver, and consisting of bile mixed with the secretion of the mucous membrane of the gall-bladder.

Gall-nuts. Nuts produced by small insects which puncture the bark of the Lusitanian oak in Southern Europe and Western Asia, and lay their eggs in the wounds. They contain much tannin and are used in making tannin, ink, dye, and in medicine. Oak-apples are formed on other oaks in the same way.

Gal′lon. [Fr.] The standard unit of cubic measurement. The British gallon contains 277.274 cubic inches, and a gallon of distilled water weighs 10 lbs. (avoir.). The gallon of the United States is the standard Winchester wine gallon of 231 cubic inches. The New York State gallon contains 221.184 cubic inches, or 8 pounds of pure water.

Galvan′ic Battery. [Ital., from *Galvani*, the discoverer in 1791.] It consists of a number of zinc and copper plates connected together, their purpose being the production of a current of electricity. These are arranged in cells, the copper-plate of one being joined to the zinc-plate of the next, and the final copper connected by a wire to the zinc of the first cell. The cells contain a dilute acid, which acts chemically on the metals, and generates an electric current which flows around the circuit of cells and wires. The connecting wire may be many miles in length, as in a telegraph line. The zinc of the first cell is called the negative *electrode* and the copper of the last cell the positive *electrode*, the current being supposed to flow from positive to negative. There are many varieties of galvanic batteries in use, and other metals than copper and zinc are employed. Formerly all electric currents were produced by the battery; now it is used only for weak currents, powerful currents being produced by the *dynamo* (*q.v.*) (See *Electricity.*)

Gal′vanized Iron. The name given to sheets of iron which have been coated with zinc. True galvanized iron is first coated with tin by a galvanic process, and afterwards with zinc by immersing it in a bath of melted zinc containing sal ammoniac mixed with mineral matter.

Galvanom′eter. An instrument for measuring the strength of an electric current by means of the deflection which it produces in a magnetized needle. The galvanometer is constructed by using a coil of insulated copper wire, in the centre of which is suspended the magnetized needle. It is frequently named the *multiplier*.

Gamboge′. [*Cambodia*, in Asia.] A reddish-yellow gum used for coloring and in medicine.

It is got from several trees in Siam, Malabar, and Ceylon. It is brought in masses from Cambodia. The best kind is of a dense, compact texture. The gamboge tree of Western India yields, in addition to gamboge, a kind of oil called gamboge butter.

Game. [AS.] Sport of any kind; animals kept or hunted for sport. In Europe game includes grouse, black game, pheasants, partridges, and hares, ptarmigans, quails and larger game as the moose and wild boar. In the United States game includes a great variety of animals. These are rarely kept in enclosures for sport, as in Britain, but they are protected from indiscriminate slaughter by game laws, confining hunters to fixed seasons and means of capture.

Games. [AS., *games*, joy, pleasure.] A term applied to certain physical exercises and mental recreations, distinguished as *games of chance* and *games of skill.* The physical games are such as cricket, football, billiards, golf, etc., the mental are card games, chess, draughts, backgammon, etc.

Gan′grene. A term applied to the first stage of mortification of the flesh. It may result from severe cold, from violent inflammation, erysipelas, and other causes, or may attack open wounds or ulcers. The part attacked loses sensibility and becomes cold and dark in color, while great languor and debility supervene. It may come in old age from a diseased state of the blood-vessels and general weakness.

Gam′ut. [Gk. letter *gamma;* and L. *ut.*] The notes of the musical scale, arranged by Guido d'Arezzo in the tenth century, with *ut* and *gamma* at the ends. The *sol-fa* words were taken by D' Arezzo from the first syllables of six lines of a hymn to St. John the Baptist:

Ut queant laxis
*Re*sonare fibris
*Mi*ra gestorum
*Fa*muli tuorum
*So*lve polluti
*La*bii reatum
Sancte Joannes.

Gan′net. [AS.] A web-footed sea-bird, found in Europe and America, and also called the solan goose. It is a bird of passage, and is very strong on the wing. The gannet follows shoals of herring, on which it feasts. Its skin, feathers, and eggs are much valued.

Gar′bage. Kitchen refuse. In small towns and rural districts this is fed to swine, but in large cities it is difficult to dispose of. In Philadelphia and some other cities it is burned in close furnaces. In others it is utilized in various ways. Thus in St. Louis the oil and grease are removed by the use of naphtha, and employed in soap making. From the remainder a good fertilizer is made.

Gar′goyle. [Fr.] A projecting spout for carrying off water, often cut grotesquely into human and other figures.

Gar′lic. [AS.] A bulbous plant with a strong smell and spear-shaped leaves, used as seasoning. Each root is composed of several smaller bulbs, *cloves of garlic*, enclosed in a common membranous coat.

Gar′net. [Fr.] The name of a mineral species which includes numerous varieties, differing in composition, color, and fusibility. It is hard, brittle, and more or less transparent. The red variety is the most common, but brown, and sometimes green, yellow, and black sorts are found. The variety which includes the *precious* garnet consists of silicate of alumina together with oxide of iron. It is transparent, and of a deep-red color, and is much prized as a gem.

Gar′ter. The band to prevent the stocking from slipping down; the badge of the highest order of knighthood in Britain, instituted by Edward III.

Gas. [Du.] Matter is capable of existing in the three forms known as *solid*, *liquid*, and *gaseous.* The gaseous condition of matter is defined as that which is capable of unlimited expansion—that is to say, that a very small quantity of any gas, if introduced into a large empty space, will always expand so as to fill the entire space. A gas may therefore be defined as matter in the gaseous state. An important property of gases is that they may be liquefied, and all gases, even the volatile hydrogen, have been reduced to the liquid state, and many of them to the solid. *Illuminating gas* is an inflammable gas produced by distillation from coal, petroleum, or other carbonaceous material. It is very largely used in cities for lighting and heating purposes, being conveyed in pipes from a central generating station, carried into houses, and burned at a small opening in a *gas burner. Natural gas* arises from wells in the earth in petroleum districts, and is similarly burned for house lighting, heating, and manufacturing purposes. Gas was first used for lighting in England about 1800, in the United States, at Boston, in 1822; New York in 1827, and Philadelphia in 1835.

Gas-engine. An engine in which the piston is worked by the alternate admission and condensation of gas in the cylinder. When a mixture of coal-gas and common air or of oxygen and hydrogen is used, condensation is produced by an explosion caused by an electric spark or a gas jet.

Gas-meters. As coal-gas enters each house it is made to pass through an iron box called a gas-meter. Within this box are wheels, which are turned by the gas; and connected with the wheels, but on the outside of the box, are three dials, on which is recorded the number of cubic feet of gas entering the house in any given time. The figures on the left-hand dial stand for hundreds of thousands, those on the middle dial for tens of thousands, and those on the right-hand dial for thousands of cubic feet. To read the index, put down the figure next behind the pointer on each dial, and add two ciphers. In this way, if the index is found to record 16,700 cubic feet of gas, and at the next examination it records 18,300 cubic feet; then by subtracting we find that 1,600 cubic feet of gas has passed through the meter in the interval.—*Gasometer*, a large tank for holding gas.

Gas′tric Juice. The thin watery fluid, with an acid reaction, secreted by a set of glands in the mucous membrane of the stomach. It is the most important digestive fluid in the body.

Gauge. [Fr.] A class of measuring instruments, whereof each has a specific name to indicate the kind of measurement for which it is to be used. Instruments of this nature are used for a variety of purposes, such as finding the capacity of a vessel (as in gauging a barrel), or in ascertaining the pressure of steam or the force of the wind or the amount of rainfall.

The standard gauge, or distance between the rails, in railways is 4 feet 8½ inches. Broad gauge is 7 feet in England and 6 feet in the United States. Any gauge less than standard is called narrow gauge.

Gauze. [Fr.] A fine, thin silk cloth first brought from Gaza; cloth of linen, cotton, fine wire, or thin fabric like silk gauze. There is a flannel called gauze flannel.

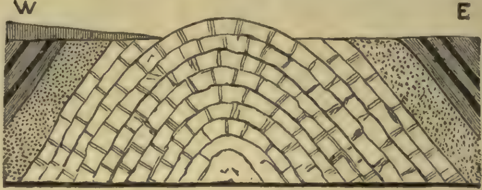
Gazelle′. [Fr., from Arab.] A small, beautiful and graceful kind of antelope found chiefly in Arabia and Syria, also in Africa, with black, incurved lyre-shaped horns, and soft eyes. They roam in herds, and are the prey of the lion and the panther. When attacked they arrange themselves in a circle and present their horns like the bayonets of a regiment of soldiers.

Geiss′ler's Tube. A glass tube in which an almost perfect vacuum is produced, and through which an electrical current is sent. In passing through the vacuum it yields a soft light. These tubes, as modified by Sir William Crookes, yield the light from which the Röntgen ray or X-ray is produced.

Gel′atine or **Gelatin.** [Fr., from L. *gelatus*, frozen.] An animal substance of a nitrogenous nature, supposed to be closely connected with the albuminous substances. It does not exist already formed in the animal tissues, but is obtained by the action of boiling water on connective tissues, cartilage, ligaments, and tendons. When its solution in boiling water cools, it forms a tremulous jelly. It is nutritious, and much used in soups and jellies. It dissolves in hot water and in acetic acid, but is insoluble in alcohol. It is largely used in many photographic processes. A powerful explosive known as *explosive gelatine* is made by dissolving 5 parts of gun-cotton in 95 parts of nitro-glycerine gently heated in a water-bath. (See *Isinglass.*)

Gems′bok. A South African antelope with long, sharp and nearly straight horns.

Geol′ogy. [Gk.] The science which treats of the history and structure of the earth. The rocks which compose the crust of the earth have not all been formed in the same way. Some have cooled from a state of fusion, and are known as *igneous rocks*. This class is represented by such rocks as granite, syenite, traps, and lavas. *Metamorphic rocks* are those which have either originally been deposited in water and have become changed into crystalline rock, or those which, originally crystalline, have become foliated in structure under great pressure. *Sedimentary rocks* comprise the various deposits which are laid down on the bed of the sea or on the land. They have all been formed from sediment

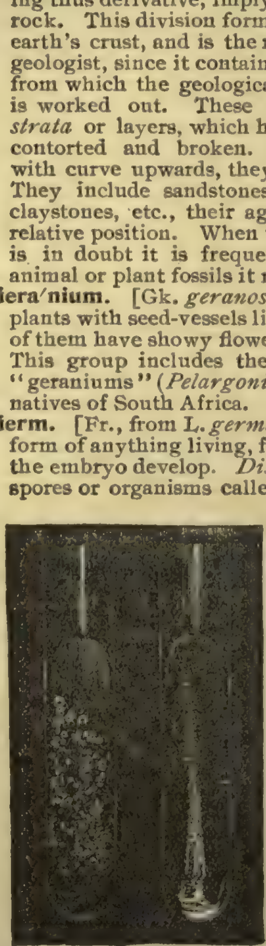


ANTICLINAL ROCKS

washed by rain and streams from the land, and, being thus derivative, imply the existence of older rock. This division forms the larger part of the earth's crust, and is the most important for the geologist, since it contains most of the materials from which the geological history of the earth is worked out. These rocks are arranged in *strata* or layers, which have been much lifted, contorted and broken. When they are bent with curve upwards, they are called Anticlinal. They include sandstones, limestones, slates or claystones, etc., their ages depending on their relative position. When the age of a rock strata is in doubt it is frequently learned from the animal or plant fossils it may contain.

Gera′nium. [Gk. *geranos*, a crane.] A genus of plants with seed-vessels like a crane's bill. Most of them have showy flowers and a pungent odor. This group includes the commonly cultivated "geraniums" (*Pelargoniums*) which are mostly natives of South Africa.

Germ. [Fr., from L. *germen*, a sprout.] The first form of anything living, from which the egg and the embryo develop. *Disease germs* are minute spores or organisms called bacteria, bacilli, and microbes, which are now known to cause disease. Most forms of microbes are healthful and many of them very useful, the hurtful species being few in number. Dr. Frankland found 20,222 microbes in one cubic centimetre of Thames water, and after filtration 401 in the same quantity of water. In the air after high winds germs are numerous, but after rain their number is small. Bacillus is a long rod form and bacterium a smaller rod form of germ.



Ger′man Silver. An alloy of zinc, nickel, and copper. It is used in the manufacture of numerous articles, such as spoons, forks, jugs, teapots, dish-covers, salvers, etc. The proportion of each

ingredient is different in different alloys. Spoons and forks are made from two parts copper, one nickel, one zinc. It is hard, and can take on a bright polish.

Gey′ser. [Icel. *geyser*, from *geysa*, to gush.] The name applied to hot springs, such as were first observed in Iceland, which eject hot water violently either at irregular intervals or periodically. The Great Geyser in Iceland throws up water to a height of from 80 to 120 feet. There are numerous geysers in the Yellowstone region of the United States, some of which throw jets of water to a height of 200 feet. They are also met with in New Zealand and in California.

Gi′la Monster. A large lizard found in the sandy deserts of Texas, New Mexico, and Arizona. It is covered with scales of brilliant orange and jet-black hues, is one of the largest of North American lizards, and has a poisonous bite, its fangs being like those of venemous snakes. Its bite is injurious but rarely fatal to man.

Gill. [Scand.] The opening by which fishes breathe (*q.v.*), and the flap which covers it. Gills are usually thin fringes or plates, through which the blood circulates, and in which it is exposed to the action of the water, from which it absorbs oxygen. The gills of shrimps are the bag-like flaps that hang down where the legs join the body. The gills of an oyster are a delicate transparent frill of four-striped bands.

Gim′let. [Fr.] A small instrument, with a cross handle, grooved body, and a sharp screw at the point, used for boring holes.

Gimp. A kind of trimming used on dresses, curtains, and furniture. It is made of silk, wool, or cotton, stiffened by a fine wire or cord twisted among the threads.

Gin. [Contraction of *juniper*.] A liquid distilled from fermented wort and flavored with juniper berries. Often called hollands because greatly made in Holland. Common gin is flavored with turpentine.

Gin′ger. [Fr., from L. *Zingiber*.] The rootstock of a plant which grows in the East Indies, Africa, and the West Indies. The finest ginger is from Jamaica. Ginger is useful for headaches and asthma, and for flavoring cakes, puddings, ginger-bread, etc. The pale-yellow ginger is the finest; black ginger is of an inferior quality, and is sometimes made into ground ginger. When whitened by chloride of lime, ginger is called bleached ginger. Preserved ginger is the ginger preserved while soft in a thick syrup. It is imported from India and China.

Gin′ger-bread. Sweet bread seasoned with ginger. There is a palm in Egypt called the ginger-bread tree, because its bark looks like ginger-bread.

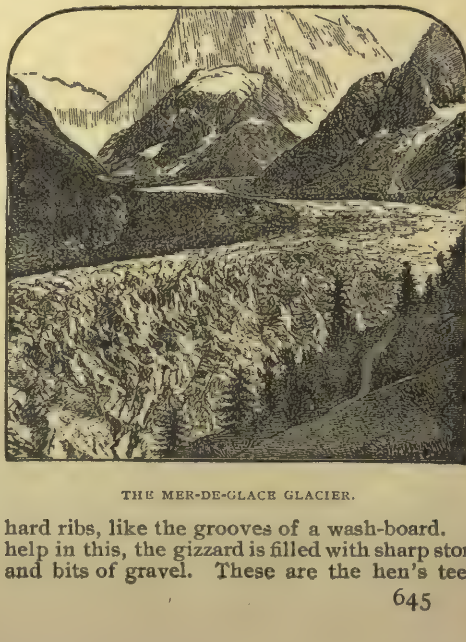
Ging′ham. [Fr.] A kind of cotton cloth made in Guingamp, in Brittany. Some ginghams are of one color, but others are woven in stripes or checks. The origin of *gingham* is also given as from a Javanese word, and the cloth so called is said to have been first made in India.

Giraffe′. [Fr., from Arab.] A ruminant animal with permanent horns in both sexes, and distinguished by the length of its legs and the remarkable length of its neck. It has points of affinity with the deer, the antelope, and the camel, and others peculiar to itself. It is the tallest animal in existence, measuring in some cases from 18 to 20 feet from the top of its head to the ground. Its home is in the woods of South Africa. Leaves of acacia trees are its chief food. It also eats green herbs, but to do this it stretches out its fore feet and bends its neck to collect the grass. Its eye is very beautiful and large, and shaded with long eyelashes. Its enemy is the lion, which watches for it when drinking on the margin of rivers and pools. It fights by kicking with its hind legs, delivering blows with great rapidity, and often wounding and driving off the lion. It is not easily overtaken even by a fast horse. It is also known as the *Camelopard*, (from Gr. *kamelos*, camel; and *pardalis*, leopard.)

Gir′der. [AS.] A strong beam in a building, supported at both ends, for binding the others together. *Half-lattice girder*, a girder consisting of horizontal upper and lower bars connected by a series of diagonal bars sloping alternately in opposite directions, so as to divide the space between the bars into a series of triangles.

Gir′dle. A narrow band of cloth or leather for the waist. *Venus girdle* is a long, flat, ribbon-like, transparent, comb-like marine animal which lives in the open sea.

Giz′zard. [Fr.] A bird's stomach. A hen swallows food without chewing, which is at once stored in the crop, where it remains till it is softened. The food then passes into the gizzard, where it is rubbed and ground between tough,



THE MER-DE-GLACE GLACIER.

hard ribs, like the grooves of a wash-board. To help in this, the gizzard is filled with sharp stones and bits of gravel. These are the hen's teeth,

and they do their work while she is gathering food or roosting. The gizzard of the grasshopper has over two hundred teeth or ribs for grinding its food.

Gla'cial Age. A geological period of late date in which low temperature continued for many centuries and vast glaciers made their way downwards from the polar regions into the temperate zone, leaving their marks in scratched rocks, terminal heaps of stones, and other indications.

Gla'ciers. [Fr., from L., *glacies*, ice.] Slow-moving rivers of ice, which derive their origin from the snow which falls on the higher slopes of lofty mountains. As the snow accumulates on the steep slopes, it acquires a tendency to descend under the influence of its own weight. In some cases it slides down slowly, and in others it breaks off in large sheets, which rush down rapidly, forming what is known as an *avalanche*. These snows, as they descend, gradually become compacted into ice and form glaciers, which extend along channels in the mountain sides to the valleys below. They are widely distributed, being met with in different parts of the American continent, and in Greenland; in Europe they occur in the Alps, in Norway, and in the Pyrenees; and in Asia in the Himalayas.

Gland. [Fr., from L. *glans*, acorn.] A knot of nerves, blood-vessels, and flesh in the body for drawing off certain substances from the blood. Each of the thousands of pores of the skin is really an outlet of a tube which connects with a sweat-gland absorbing water from the blood. Two oil-glands are attached to each hair, and the natural oil ought to be sufficient for the hair. The oily matter runs out of the skin and mixes with the sweat. The sweat produced by the skin of an ordinary man in twenty-four hours measures a pint and a quarter, and weighs 1½ lb.

Glass. [AS.] A substance composed of a mixture of two silicates—one being a silicate of an alkali metal, and the other a silicate of an alkaline earth. There are four different kinds of glass, each of which possesses special properties suited to the particular purpose for which it is used. 1. Crown glass, sheet glass, and plate glass are each composed of the same materials—namely, silicates of sodium and calcium; but the method of manufacture is different in each case. Crown glass was at one time the only kind used in England for windows, but it has been superseded by sheet glass. For plate glass great care is taken in the selection of the materials, and the proportion of lime used is somewhat less than in the other two kinds. 2. Bohemian glass consists of silicates of potassium and calcium. This glass is very hard and difficult to melt, and is much used for chemical apparatus, or whenever a glass is required which can withstand heat. 3. Flint glass, or crystal, contains silicates of potassium and lead. It is employed for table glass, globes, ornaments, etc. Glass for optical purposes is made both of flint and crown glass. 4. Bottle glass is an impure mixture of various silicates, such as sodium, calcium, iron, and aluminium. In this variety the color and quality of the glass are not of the same importance as in the other three kinds. In glass manufacture the materials are melted together in a highly heated crucible. A portion of the melted mixture is then taken up by the glass-blower on the end of a long tube, and blown by him into a hollow pear-shaped bulb. It is then given the desired shape by various processes of handling. Many articles of glass are formed in moulds, and other methods of manufacture are employed. The grinding and cutting of glass are subsequent processes for the purpose of ornamentation.

Glass-sponge. A sponge which forms a framework of spicules of silica, which, when the fleshy parts are washed away, looks like the finest spun glass. One species is the handsome Venus flower-basket, another is the Japanese glass rope sponge.

Globe. [Fr., from L. *globus*, ball.] A round body imitating the earth and made of some light material. At two opposite points are fixed two pins, round which it turns; these are called the poles. The two pins produced through the centre represent the axis of the globe. The pins turn in two holes made in a brass circle surrounding the globe, called the *brass meridian*. Round the middle of the globe, at an equal distance from the poles, a circle is drawn, and divided into 360°, called the *equator*. Another great circle drawn round the globe, and inclined to the equator at an angle of 23½°, is called the *ecliptic*. It indicates the sun's line of apparent annual motion.

Glove. [AS.] A covering for the hand, with a separate place for each finger. Gloves are made of worsted, cotton, silk, or of different skins. The finest kid gloves are made from skins of kids, but coarser kinds are made from lamb, rat, and other thin skins. They are prepared and dyed, and punched into different shapes for the different pieces of the glove. The two edges to be sewn are placed in a vice having fine teeth like a comb. They are then damped and pressed.

Glow-worm. [AS.] An insect that gives out light in the dark. The female is without wings, and emits the light to attract the male, which is winged. To keep the light bright, this insect has a brush attached to its tail, with which it

keeps its back clean. The light is emitted from segments of the abdomen.

Glu'cose. [Gk. *glykys*, sweet] or **Grape Sugar.** A kind of sugar found in grapes, less sweet than cane sugar. In the United States it is chiefly prepared from corn starch, where the syrup is known commercially as *glucose*, and the solid product from the same source as *starch sugar*. In Europe it is made from potatoes. Glucose is used chiefly in the preparation of table syrups and confectionery, in brewing, in the preparation of artificial honey, and as food for bees.

Glue. [Fr., from L. *gluten*, glue.] A sticky animal substance or kind of impure gelatine, hard, and of a bright brown color. When melted it is adhesive and tenacious. It is made from the horns, hoofs, and sinews of various animals, or from scrapings and cuttings of their skins. These are cleansed, boiled, strained, boiled again, poured into layers or cut into squares and dried. Glue is very useful to the joiner and cabinet-maker.

Glu'ten. [L.] A mixture of various vegetable albuminous substances found in the flour of wheat and other grains. It is a very tenacious substance, and contributes much to the nutritive properties of flour.

Gly'cerine. [Gk. *glykys*, sweet.] A colorless, inodorous, syrupy liquid, having a very sweet taste, soluble in water and alcohol, but insoluble in ether and chloroform. It is obtained from fats. It has numerous uses both in the arts and in medicine. It is used in calico-printing, in perfumery, in leather-making, and in the manufacture of copying ink. When added to water, it lowers the freezing point, and has in this way been serviceable in preventing the freezing of the water in gas-meters. In medicine it is applied externally for softening the skin, and it may be used as a substitute for cod-liver oil. Dissolved in a mixture of nitric and sulphuric acids, it yields the powerful explosive called nitro-glycerine (*q.v.*)

Gnat. [AS.] A small insect with a sting; a blood-sucking fly which undergoes changes of form in water. The females have a needle-shaped proboscis for penetrating the skin of plants and animals. The mosquito is a gnat which injects poison into the wound it makes, and is very annoying in many localities.

Gneiss. [Ger.] The name of a species of rock closely resembling granite. Like granite, it is composed of *mica*, *quartz*, and *feldspar*, but in separate layers. Its texture varies from a fine-grained rock up to a coarse crystalline.

Gnu. A singular kind of antelope, sometimes called the horned horse, and found in South Africa. It is about the size of a half-grown colt. It has short brown hair and a white tail, and a mane on its neck. It has low bent horns and cloven feet, which have all the lightness of those of the stag. Its flesh is like venison, and is much esteemed.

Goat. [AS.] A hoofed animal, closely related to the sheep, and found either wild or tame in almost every part of the world. It is easily tamed, and is a hardy, healthy animal. Its horns curve outward, its chin is bearded, its covering is of hair rather than wool, and its tail is short. It thrives on scanty pasture, where a sheep could not find support. Goats roam on hills, and in many countries are very numerous. Large flocks may be seen on the mountains of France, Switzerland, and Italy. The skin of the goat makes excellent leather; that of the young goat or kid is used for gloves. Goat-skin also makes morocco leather. The fleece yields two kinds of hair, long and short. Ropes and lawyers' wigs are made of goats' hair. The hair of Cashmere goats is woven into fine shawls. The Angora goat resembles the Cashmere, and its hair is used in making zephyr cloth.

Gold. [AS.] A precious metal, one of the metallic elements. It is distinguished by its bright-yellow color, its great ductility and malleability. It is nearly as soft as lead. It has always been highly prized for its beauty of color and lustre, and its power of resisting oxidation (not tarnishing in the air), and for the ease with which it can be worked into artistic and ornamental articles. Its scarcity has led to its adoption as a convenient medium of exchange. Gold is always found in the metallic state. It occurs in grains and strings, and occasionally in lumps or nuggets, and is found dispersed through the gravel deposits in districts where gold-bearing quartz veins traverse the solid rocks. In order to obtain the gold from the gravel or *placer* deposits, the sand containing the metal is washed in an apparatus called a *cradle;* by this means the lighter materials are washed away, and the gold being heavy, sinks to the bottom. Much gold is also obtained from quartz veins in the rocks, by costly processes of mining and extraction. Gold is found in nearly all countries. It occurs abundantly in Australia, North America, and Africa. Very rich deposits were discovered in Australia and California about fifty years ago, and in South Africa at a much later date. Much gold is now obtained in Alaska.

Gold'finch. A beautiful song-bird of Europe, with gold-colored wings, and known as the yellow-bird. It has a black cap and wings, and is some times called American canary. (See *Finch.*)

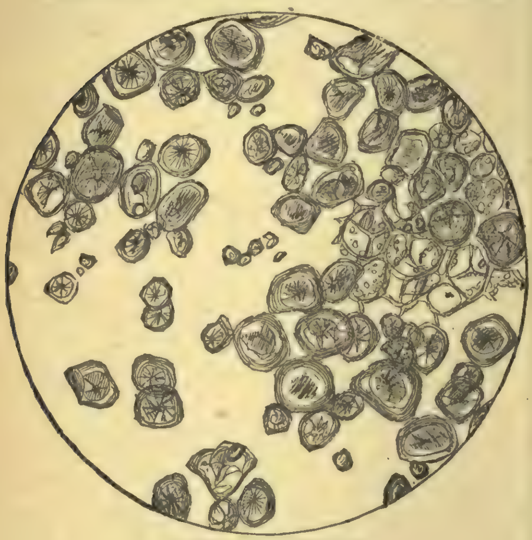
Gold-fish. A small domesticated fish of reddish-golden color, kept in ponds or in glass jars. It is a native of China, and was introduced into Europe in 1691. Many varieties are known. A monstrous variety of gold-fish, with protuberant eyes, is called the telescope fish.

Gold-leaf. This is gold hammered until it forms a very thin leaf. It can be beaten so thin that it would take a pile of 200,000 leaves to make an inch in height. It is used for gilding, by spreading it on wood and other substances. Leaves not so fine are used by dentists for filling teeth.

Golf. [Du.] A game played with a variety of clubs and a ball, the object being to drive the ball into each of a number of holes (usually nine or eighteen) with the fewest strokes of the club. It is a Scotch game, which has of late years become very popular in the United States.

Gong. [Malay.] A round piece of bronze, with a rim round the edge, giving a loud sound when struck. Gong-metal is 78 parts of copper and 22 of tin.

Goose. [AS.] A swimming-bird of the same family as the swan and duck. It is common in most parts of the world. The gander is usually white and the female gray. The goose is larger than the duck. It feeds chiefly on rushes and insects. The common European goose is supposed to have been derived from the graylag goose. The bean goose, the American wild goose, and the Arctic goose are the best known kinds. The Cape Barren goose of Australia, though web-footed, never swims, but is a grazing-bird.



CORNSTARCH CORPUSCLES
Seen under the Microscope.

Wild geese are of a grayish-brown color, and migrate from the tropics to northern regions and the reverse. They fly in two lines like the sides of a triangle, in flocks of from ten to one hundred. They nest in swamp grass, and, though undisturbed by natural sounds, are quickly on the alert on the approach of the hunter.

Goose′berry. [Fr. *grose*, meaning curled or hairy.] A fruit or berry, often rough with hairs, growing on a bush with sharp prickles.

Goril′la. [African.] A remarkable animal; the largest of the ape or monkey tribe. It has immense canine teeth, powerful muscles, and great strength, and does not hesitate to attack the lion, yet it is a vegetarian. It lives in the dense African jungle. It walks in a peculiar way, swinging its body between its long arms. The females and young live much in the trees and the males on the ground. It is very fierce and difficult to capture and tame.

Gos′samer. [O.E., goose summer, or Mary's yarn or threads.] Thin webs or threads of webs floating in the air, specially in fine weather or in the autumn.

Gourd. The family of plants which includes the pumpkin, squash, melon, cucumber, etc. The bottle or calabash gourd, growing wild in Asia and Africa, bears a fruit like a water-bottle, whose rind is very hard when dry. It is used for bottles, dippers, and other purposes.

Gov′ernor. An instrument used to regulate the supply of steam to the cylinder of a steam-engine. It consists of two heavy balls at the end of two rods, whose other ends are jointed to a shaft, turned by a strap from the engine. When the engine moves these balls revolve and separate by centrifugal force, becoming wider apart the faster the engine moves. They act upon a rod which operates the throttle-valve of the engine. When the engine is going too fast this valve is partly closed and the supply of steam reduced, when going too slow it is opened wider and more steam let in. By this means the supply of steam and speed of the engine are kept uniform.

Graft. [Fr.] A bud or branch of one tree put into another, the stock of which is to support and nourish it. There are various kinds of grafting—cleft, rind, saddle, side, skin, splice, root, and tongue.

Grain. [Fr., from L. *granum*.] A single hard seed of corn. The lines of fibres running along the length of a piece of wood. The grain is the unit of the English system of weights. The pound avoirdupois is 7,000 grains; the pound troy is 5,760 grains. A grain is .0048 of a gramme.

Gramme. The weight of one cubic centimetre of distilled water at the temperature of 4° C. (39.2° F.), weighed at Paris. It is the unit of weight in the metric system.

Gram′ophone. A kind of phonograph invented by E. Berliner about 1895. It has a circular plate of metal covered with a thin film of grease, which the tracing point scratches in a sinuous spiral line. The record is then etched into the plate by acids, and is reproduced in the usual manner.

Gran′ite [Ital. from L. *granum*.] A crystalline rock composed of mica, quartz, and feldspar. In granite each of these minerals is in fragments large enough to be recognized by the naked eye. It occurs in large masses, which have been intruded in many other kinds of rock, and also in smaller masses and veins. It belongs to the class of eruptive rocks, or those which have been pushed up from beneath to the surface by the action of heat. It is met with in great abundance both in Europe and America, and is much used in public buildings, in making docks, and in paving streets.

Grape. [Fr. from O. Ger., a hook or cluster.] The berry or fruit of the vine (as one of a cluster). The berries are smooth-skinned, and have a juicy pulp, and are grown for table use and for making wine and raisins. The principal wine-making countries in Europe are France, Spain, Italy, Portugal, and Germany. Much wine is made in the United States. Many grapes are also grown in Greece, Australia, Cape of Good

Hope, and other countries. The grapes of Greece and Asia Minor are made into raisins.

Grape Sugar, (See *Glucose.*)

Graph'ite. Native carbon in six-sided crystals or in granules, with a black color and metallic lustre. It is used for pencils, for crucibles, and as a lubricator.

Graph'ophone. A modification of the phonograph, which uses, instead of tin-foil, a mixture of wax and paraffine spread upon paper. For commercial purposes this instrument may take the place of the stenographer, correspondence being dictated into it and reproduced by the copyist. For entertainment it will yield a great variety of speech, song, and music.

Grass. [A.S.] Herbage; green fodder; the plant which forms the food of cows, horses, and other hoofed animals; also the class of grain plants with narrow leaves and hollow stems, as wheat, oats, barley, rice, etc. A meadow is a field permanently occupied by grass. When the grass is eaten off by animals it is called a pasture, and when allowed to grow and made into hay it is called meadow hay. Bamboos, though high, are also jointed like grasses. Grasses produce flour, meal, starch, sugar, beer, whiskey, paper and everything made from straw.

Grass'hopper. [A.S.] A small insect that hops among and feeds on grass in summer. Most grasshoppers are colored like the leaves and grasses on which they feed. They do not move in flocks, and are more active at night than by day. They cannot walk, but move by leaps. They have large wings, but do not fly far. The males make a shrill sound with their wings. The katydid makes a sound which is sometimes heard a quarter of a mile distant. The eggs of the grasshopper are covered with a thick skin, and lie all winter in water. Turkeys and other fowls devour many grasshoppers.

Grate. [Low L., a framework of bars.] A set of bars within which the fire burns. In ordinary fire-places most of the heat goes up the chimney; and to prevent this the back and sides of the grate are lined with fire-clay or made of fire-bricks, which reflect the heat into the room.

Grav'el. [Fr.] Loose, rounded, water-worn fragments of rock in which the pebbles range in size from a pea to a walnut. When smaller, they form sand; and when larger, shingle. Gravel is formed by the action of rivers and of the sea; and, since the pieces of the harder species of rocks are best able to withstand the action of water, gravel is found to consist chiefly of fragments of quartz and other silicious materials.

Gravita'tion. The name given by Sir Isaac Newton to his law of attraction, by which every atom in the universe attracts every other atom, with a force varying with distance. It is this force which holds the heavenly bodies in their places, causes the planets to revolve round the sun, and makes falling bodies descend to the earth. The force of attraction is called *gravity*. On the earth it causes a body to fall 32.2 feet a second.

Grebe. A crested swimming-bird about the size of a duck. When swimming it steadies its legs at the rear end of its body, and paddles with its lobate toes in the water. Its nest is a light raft, and floats on the lakes and ponds, where the tall rushes and reeds grow. If an enemy discovers the nest, the bird puts one foot out, and, using it as a paddle, guides the nest to safer waters. As soon as the young are hatched the male leads the little ones into the water. When they are tired of swimming they mount upon the backs of the old birds. The mother bird induces them to dive by holding food in her beak, going backwards as they come near, until she gets them to go under the water to catch it.

Grippe. (See *Influenza*).

Grouse. [Fr.] A game-bird that lives among heather on hills. It inhabits Europe, Asia, and North America. It has a plump body, strong, well-feathered legs, and mottled plumage. Among the varieties are the red grouse, the hazel grouse, the ruffed grouse, the pine grouse, and the spruce partridge.

Grub. [AS.] A worm or larva produced from the eggs of moths, beetles, etc. Grubber is a machine or tool for uprooting stumps or breaking roots.

Gua'no. [Span.] The dung of a sea-fowl, used as a manure, because it contains an abundance of the silicious skeletons of animalcules, and is rich in phosphates and ammonia. Guano was first brought to Liverpool in 1839, from the Chincha Islands on the coast of Peru, but is now exhausted there. It is now obtained from the Macabi and the Huanape Islands. Countless numbers of sea-birds have lived on these islands for thousands of years, and as rain seldom falls their excrement has accumulated to a depth of 200 feet. Guano has a pungent smell, due to the ammonia it contains. By adding to the guano some sawdust wetted with sulphuric acid, the ammonia is fixed, so that its loss is prevented. Guano is an excellent manure for wheat, potatoes, and green crops on strong clay soils. In the great bat-caves of San Antonio, Texas, a shaft has been sunk some hundreds of feet back from the mouth, by means of which it is possible to dig out the guano of the bats without disturbing the enormous number of sleeping bats that doze there during the day. The guano of these bats is the finest exported, because never exposed to rains, which wash out much of the virtue of Peruvian guano.

Guil'lemot. [Fr.] One of several northern sea-birds allied to the auk. It has short legs placed far back, and is expert at diving and swimming. The common guillemot or murre is abundant on the northern coasts of Europe and America, and lays one or two eggs on the barren rocks without any nest.

Guil'lotine. [Fr.] An instrument with an upright frame and a heavy axe, used in France for executions; also a paper-cutting machine with descending knife worked by hand or steam.

Guin'ea. [African.] A coin first made in 1663 of gold from Guinea in Africa, worth 21s. No guineas have been coined since 1817.

Guin'ea-fowl or **Guin'ea-hen.** A bird somewhat like a turkey, of a dark-gray color and with white

spots. Its neck is long, and its head has a top-knot, and a fleshy horn on each side. It is noisy and quarrelsome in the farm-yard, but its noise protects poultry from the hawk. Its flesh is a delicacy, and its eggs are valued for their richness.

Guin′ea-pig. A small rodent animal from South America, somewhat like a pig, but also like a rabbit. It has short glossy fur, dark brown or white, with black, white, or yellow patches, or tortoise-shell colors. It feeds on vegetables, especially parsley and carrot tops. It is also called cavy, (*L. Cavia.*)

Guitar′. [Fr., from Gk.] A musical instrument with six strings, the three highest of which are of catgut, and the three lowest of silk covered with silver wire.

Gulf Stream. A great ocean current of warm water, which flows in the Atlantic from the equatorial region, through the Gulf of Mexico, and along the eastern coast of the United States at some distance from land. Its waters cross the ocean and reach the shores of Europe, whose climate is made warmer by its heat.

Gull. [Celt.] A web-footed sea-bird. Gulls live upon fish, but many follow ships for long distances to pick up the pieces of food thrown overboard. They also rob weaker birds of their food, and have been known to snatch fish from the beaks of pelicans. They vary in size, some being small like pigeons, others about 17 inches long. The bill is yellow, and the feet and legs of a greenish white color. The back and wings are gray, but the head, breast, tail, and under part of the body are pure white. The gull lays three eggs of brownish-olive color, nearly as large as those of the common fowl. All gulls have weak feet and three webbed toes. The largest gulls are the burgomaster or glaucus gull, and the skua or Arctic gull, which frequent the Arctic regions. The tern or sea-swallow has long slender wings. The albatross (*q.v.*) is another large gull. The stormy petrel (*q.v.*) is the smallest of web-footed birds.

COFFEE ADULTERATED WITH CHICORY, MAGNIFIED.

Gum. [Fr., from Gk. *kommi.*] The sticky or adhesive juice of certain trees or plants. Vegetable resins are insoluble in water, but soluble in spirits. Gum resins are soluble in either water or spirits. Gum copal is a fossil dug out of the ground in various parts of the earth. It is brought in large quantities from the east coast of Africa. It is found in the sandy plains about a foot from the surface, and is derived from trees of recent times, while amber is from forests of a past geological period. Gum arabic is the juice of several acacia trees that grow in Arabia, India, and Africa, and dissolves in water. Dextrin is made from starch by mixing it with nitric acid, and is now used instead of natural gums. It is used in calico-printing and for postage-stamps. The Gum tree of Australia is the eucalyptus (*q.v.*), with rigid leaves turned to the zenith, and secreting resinous gums. Two American trees are known as the sour gum and the sweet gum.

Gun. An instrument made of a hollow tube for firing shots by means of explosives. The word is applied to the ordinary musket and rifle, and also to cannon of all sizes. Guns increased enormously in size during the past century. The heaviest cannon on Nelson's ship, the *Victory*, had a 68-pound ball. Cannons are now made which will send a ball of more than a ton weight.

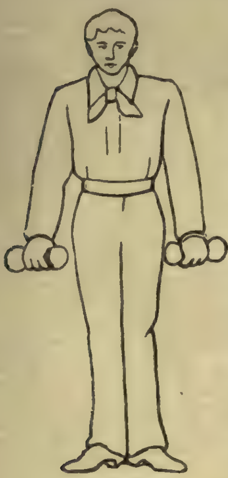
Gun-Cotton. An explosive prepared by steeping cotton-wool in a mixture of equal volumes of strong nitric and sulphuric acids. The cotton, after drying, is not perceptibly altered in appearance, but its weight has increased about 70 per cent., and it has become very inflammable. It is largely used instead of gunpowder, over which it possesses several advantages. The explosive power of one pound of gun-cotton is more than three times that of the same weight of gunpowder. Collodion, used by photographers, is gun-cotton combined with alcohol and ether. Celluloid is gun-cotton combined with camphor and other substances.

Gun-metal. A bronze usually composed of nine parts of copper and one of tin, used for cannon.

Gun′ny. A cloth made of jute fibre. Gunny cloth is a coarse bagging in which pepper, ginger, sugar, etc., are shipped from India. It is also brought to the United States and used to cover cotton bales.

Gun′powder. A well-known explosive, consisting of an intimate mixture of nitre, charcoal and sulphur. In the manufacture of gunpowder the ingredients selected must be perfectly pure, and they must be reduced to powder separately. They are then roughly mixed, sprinkled with water, and formed into a cake, which is afterwards broken up, granulated, and separated into classes by sieves of different sizes of mesh. The violence of the explosive power of the substance is due to the sudden evolution of large quantities of gas. Gunpowder is supposed to have been

known to the Chinese before the Christian era, but is believed to have been first used in warfare in the seventh century by the Byzantine emperors in the defence of Constantinople.


GYMNASTICS.

Gur'net and **Gur'nard.** [Fr., from L. *grunnire*, to grunt.] A kind of marine fish, supposed to make a grunting noise when taken out of water by the vibration of the muscles of its air-bladder. It has a large and spiny head, with mailed cheeks and large eyes. Some gurnards are highly esteemed for food. The flying gurnard is found in the Atlantic, and is able to fly like the flying-fish. It has large pectoral fins filled with nerves, by the aid of which smaller animals are detected. Thus they serve as food-providers.

Gus'set. [Fr., from Ital. *guscio*, a husk or pod.] A small piece of cloth let into a garment for strengthening or widening it, especially under the arm-hole of a shirt.

Gut'ta-per'cha. [Malay.] The hardened juice or gum of a tree called percha, common in the Malay Islands. (See *Caoutchouc* and *India Rubber.*)

Gymnastics. [Gr.] A series of exercises arranged according to method for developing and strenghtening the muscles and bodily organs. These include work with dumb-bells, Indian-clubs, wands etc.

Gyp'sum. [Gk. *gypsos*, chalk.] Sulphate of lime a common mineral, of which there are large beds in many parts of the United States. When burned and ground it becomes plaster of Paris. Ground gypsum is often used by farmers as a manure. Alabaster is a fine grained white or light-colored gypsum. Satin spar, a beautiful fibrous variety, is used for necklaces and inlaid work.

Gy'roscope. [Gk. *gyros*, a circle; and *skopein*, to see.] An apparatus consisting of a heavy rotating disk mounted on gimbals, so that it can turn in any direction. When rotating it will constantly point to the same star, and may therefore be employed to show that the apparent rotation of the heavenly bodies is due to the rotation of the earth on its axis in the opposite direction.

H

Had'dock. (*Gadus æglefinus.*) A food fish of the Cod family, found in large shoals not far from the shore. It weighs from 2 to 4 lbs., and is distinguished by a large black spot on each side, fabled to be the prints of the finger and thumb of St. Peter when he took the tribute-money from its mouth. The haddock is found off the Irish and Scottish coasts, and from New York to the Arctic Circle in the Atlantic. Large quantities are cured in the fishing villages of the east coast of Scotland. The method employed is to cleanse the haddock, steep it for a short time in brine, and smoke it over a wood fire. This was first done in the village of Findon, Kincardineshire, and the fish cured in this way are now known by the name of *Findon* or "Finnan" haddocks.

Hail. [AS. *hagel.*] Frozen water falling from the clouds. There are two kinds of hail, the small grains, which often fall in winter, and generally come before snow; and larger hail, which falls usually in hot weather. The first kind is caused by the freezing of rain drops as they fall through air colder than that from which they started. How the second kind is formed is not well known. It is supposed to be the result of a tornado whirl in the upper air. Sometimes the particles of hail meeting congeal into large masses called hailstones. These hailstones often do great harm to crops.

Hair. A fine thread-like substance, of various forms and colors, developed from the outer skin of mammals. Each hair consists of a shaft and root. The shaft or part above the skin does not grow, but the bulb or part under the skin, which is made up of little cells, grows by forming new cells, the old ones being pressed forward, and becoming a part of the shaft. Its color is said to be caused by a kind of oil which comes from the cells in the bulb. Porcupine quills, hedgehog spines, and rhinoceros horn are all developments of hair. Straight hair is nearly round, but curly or crisp hair, like that of the negro, is flattened, and the hair of the Bushman in Africa is nearly as flat as a ribbon. Hair is very strong and very lasting. It is also very elastic or springy, and for this reason is much used for stuffing cushions, mattresses, sofas, etc. Horse hair is used for making hair-cloth and other purposes, and the hair of cows, camels, goats, and dogs is used for weaving, and the hair and fur of beavers, rabbits, and other small animals for making felt. Hogs' hair and bristles are largely used in brush-making. Human hair is used chiefly for making wigs, curls, etc. Most of it comes from France, Italy, Germany, Russia, and South America. Young peasant women sell their hair to wandering dealers, who go round to collect it. These sell it to hair-merchants, who partly dress it, and sell it again to the wig-makers. Human hair is also plaited into ornamental work, such as chains, brooches, and pictures and this has in some countries become a kind of art.

HAIR MAGNIFIED.
E, Shaft; F. Root; G, Fat-Cells.

Hal′ibut. [O.E. *Hali*, holy; and *butte*, flounder.] A large, flat sea-fish eaten on holidays. It weighs from 100 to 400 lbs., and is caught by hook and line from Spitzbergen to Iceland, and from Finland and Scandinavia to the British and French coasts, and along the Atlantic coast from New York northwards. The bait used is small herring.

Hallow-even or **Hallowe'en′.** This is the evening of the 31st of October, so called as being the eve of All-Hallows, or festival of All-Saints, which falls on the 1st of November. It is a night on which spirits, good and evil, are supposed to be abroad and witches to hold high holiday. Then nuts and apples are in great demand, and are used for the purpose of foretelling future events in love affairs. In the north of England Hallowe'en is known as Nutcrack Night.

Ha′lo. [Gk. *halos*, a round threshing-floor.] A white or colored circle of light round the sun or moon. These circles are due to the presence of ice crystals in the air. In paintings, the heads of holy persons are sometimes surrounded by a ring called a halo.

Ham′mer. [Sax. *hamer.*] A well-known tool used for driving nails, beating metals, etc. Hammers are of various sorts, but nearly all consist of an iron head fixed crosswise to a handle of wood. Almost every kind of trade has a hammer of its own. *Power hammers* are those which are worked by machinery. Among them are forge-hammers, used for hammering into shape heavy masses of red-hot iron; and tilt-hammers, used for lighter work, such as forging bars of steel. The steam forge-hammer was invented by James Nasmyth in 1839.

Ham′mock. [Span. *hamaca.*] A kind of hanging bed, chiefly used by sailors. It consists of a piece of hempen cloth or of strong netting, 6 feet long, and 4 feet wide, gathered together at each end and hung to hooks under the deck. Hammocks of netting are often swung from trees in gardens as a pleasant place for resting in fine weather.

Hand. The extremity of the arm, consisting of the palm and fingers, connected with the arm at the wrist. In all there are 27 bones in the hand. Eight of these are carpal bones, and form the wrist; 5 are meta-carpal bones, found in the palm; and 14 are phalanges—2 in the thumb and 3 in each of the fingers. The hand is the organ of touch, and there is no part of the body where the sense of touch is so acute as at the tips of the fingers. The activity and pliancy of the movements of the hands are remarkably displayed in the playing of the pianist and violinist. A skillful pianist produces about 960 notes a minute in quick time; and this gives a fair idea of the rapidity of movement which can be attained by the hand.

Han′dicapping. A term used in various sports and games to indicate the position of competitors, so that all shall have as nearly as possible an equal chance of winning. In horse-racing, weights are put upon horses not less than three years of age in proportion to their recorded performances. In foot racing, cycling contests, etc., competitors are started at different distances in proportion to previous performances. In chess and draughts, certain "men" are given up by the better player; and so on in other cases.

Hang′ing Garden. A series of magnificent gardens laid out on elevated terraces at Babylon. They were said to be 400 feet square, thus containing nearly four acres, and over 300 feet high. Water was forced up from the Euphrates to cool the air, water the soil, and supply the fountains.

HANSOM.

Hansom. A low two wheeled cab closed in front by a lid-like apron and having a driver's seat perched back of the top. It is drawn by one horse and used extensively in large cities to convey passengers from one point to another.

Har′bor. [Sax. *here-berga.*] A port or haven for ships. A general name given to any bay or inlet affording ships protection from the wind and sea. Some of these are natural, but many are constructed by breakwaters. In connection with harbors artificial docks are constructed, in which the water is kept nearly at the same level, which gives facility in loading and unloading.

Hard′pan. A stratum of hardened clay, sand, or gravel, from one to three feet under the soft soil, which it serves as a foundation.

Hare. (*Lepus.*) [Sax. *hara.*] A well-known animal, with long ears, a short tail, soft hair, and a divided upper lip. Hares are found almost all over the world. They differ from rabbits chiefly in their habits. Rabbits live together in burrows dug under the ground; but hares live separately, each one making a nest of grass for itself. They pass the greater part of the day in sleep, and in the evening creep out to feed. Green vegetables and root crops are their chief food. Hares are very timid, and move swiftly by leaps. They afford fine sport to the hunter, and in some countries are hunted with hounds. Their flesh is very good, and is much used for making soup.

Har′lequin. The name of one of the characters in a pantomime; of Italian origin. The harlequin is the trickster and the wit of the play, and commits all sorts of knavish acts.

Harmo′nium. A musical keyed instrument in which the tones are produced by forcing air by means of a bellows so as to cause the vibration of free metallic reeds. The first instrument of

a really useful kind was the invention of Debain of Paris, in the year 1840. This instrument has now become one of the most common for use in homes, schools, and places of worship.

Har′ness. [Fr. *harnois.*] The trappings of a draught-horse, whether for a wagon, coach, gig, etc. It may be said to consist of four parts: (1) the driving part, or bridle and reins; (2) the drawing part, consisting of the collar, hames, and traces; (3) the supporting part, for holding up the shafts, made up of the saddle and its parts; and (4) the holding-back part, or breeching.

Harp. [Sax. *hearpa.*] A musical stringed instrument. It was very much esteemed by the ancients, and is pictured on the Egyptian monuments. The modern harp is in form nearly triangular, and the wires stretch from the upper part to one of the sides. It stands erect, and is played with both hands by pulling the strings with the fingers and thumbs. The harp is now sometimes used in an orchestra.

Harpoon′. [Fr. *harpon.*] A spear or javelin used for the capture of whales and other large fish. It is made of iron, about 5 feet long, with a sharp flat point with barbs. The edges of the point are made sharp, so that it will go into the whale easily, and then the barbs keep it from pulling out. It is thrown by the hand, but sometimes is discharged from a gun. The *gun-harpoon* is a short bar of iron, with a ring at the end to fasten a rope to. This is fired from a small cannon in the bow of the boat.

Har′row. [Sw. *harf.*] An implement of agriculture chiefly used for breaking up lumps of earth and smoothing ploughed land, and for covering the seeds previously sown. It consists of a frame of varied form, now chiefly made of iron, in which are fixed rows of iron spikes.

Hat. [Sax. *hæt.*] The principal outdoor covering for the head. Hats are chiefly made of felt, silk, or straw. For felt hats the fur of rabbits and hares is used, and for commoner kinds sheep's wool. Silk hats are made of two or three layers of calico saturated with varnishes, moulded into shape on wooden blocks, and covered with fine silk plush. In the manufacture of straw hats the straw commonly used is that of wheat or barley.

Hawk. [Sax. *hafoc.*] A name common to many species of birds of prey belonging to the Falcon family. Hawks differ from true falcons by having shorter wings and an unnotched bill. (See *Sparrow Hawk.*)

Hawk′ing. The art of training and flying hawks, to capture other birds. This practice, called *falconry*, is of high antiquity, and in old times was a favorite amusement with the rich, and to some extent with the poor. It has now gone out of use.

Haw′thorn. [Sax. *hægthorn.*] A shrub or small tree which bears the *haw*. It is a native of Europe, Siberia, and the north of Africa. In Britain it is largely planted both for hedges and for ornament.

Hay. [Sax. *heg*, *hig.*] The stems and leaves of grasses cut and dried for fodder. After being mown, the grass is shaken up and spread abroad evenly over the ground, to be dried by the sun. This is continued for several days, the hay being raked into windrows at night and into small heaps if rain threatens.

Hay Fever. A warm weather disease; its symptoms are those of common catarrh, yet very difficult to cure, and recurring annually at a fixed time. It is thought to be due to the pollen of certain plants. Some persons are very susceptible, but most people not at all so.

HAWK.

Ha′zel. [Sax. *hæsel.*] A genus of nut-bearing plants or small trees of the order Coryleæ. The hazel is a native of all the temperate parts of Europe and Asia. It is also common in North America. In England the hazel is cultivated for its nuts (*filberts*), from which, on pressure, a valuable oil is obtained. The wood of the hazel is largely used—the smaller kind for making crates, baskets, hoops, whip-handles, etc.; and the larger wood for charcoal, which is in great demand for forges, for the manufacture of gunpowder and of artists' crayons.

Heart. [Sax. *heort.*] A hollow muscular organ, with four chambers, in the higher animals. It is the centre of the blood's motion in an animal body, and is situated in the thorax. The blood flows from the veins to the two right chambers of the heart (auricle and ventricle), then to the lungs, next to the two left chambers, from which it is driven into the arteries. Thus the circulation is carried on and life maintained. The heart of a reptile has only three chambers, and of a fish only two, so that the blood is imperfectly aerated, and there is little animal heat.

Heat. A force in nature known by its effects in fusion and evaporation. Formerly it was supposed to be a subtle fluid, which was known as caloric. It is now regarded as a kind of motion,

being in general a form of vibration or disturbance of molecules. One of the most important effects of heat is to alter the temperature of bodies. A piece of iron put into burning coals becomes hot, because the heat passes from the coals into the iron, until both have reached the same temperature. Heat also alters the dimensions of bodies. For example, the tire of a wheel is made a little too small, and when heated it enlarges so as to slip on easily. It cools down to the same size as it was at first, and then fits so tightly that it binds all parts of the wheel firmly together. The ends of rails are always left a little way apart on railroads; for if rails were laid close together the heat of the sun might expand them, and push them out of place. Heat is communicated to different bodies in at least three distinct ways. First, by convection, as when water is heated in a kettle (over the fire). Second, by conduction—that is heat traveling from one end of a substance to the other end. Hence we have good and bad conductors of heat. Metals are good conductors, glass is a bad conductor, and wood is a still worse one. This is the reason why iron tools for heating in fires have wooden handles fitted to them. A third way is called radiation. This may be best illustrated by placing some substance near a fire. The heat passes over to it or is radiated to it from the fire.

Heath. [AS. *hœth.*] A genus of narrow-leaved evergreen shrubs of many species (from 400 to 500 are known). Over a dozen inhabit Europe, and have small pink flowers; the remainder are natives of South Africa, many of them bearing brilliantly-colored flowers. *Heather* is a species of heath.

Hedge. [AS. *hege.*] A fence of thorn bushes or other shrubs or small trees planted round a field, or in rows to separate the parts of a garden. Hedges are very common in many parts of Britain and Italy, but comparatively rare in France and Germany, as well as in America. They are usually of one or more of the following species: hawthorn, blackthorn, privet, holly, beech, maple, alder, poplar, willow, yew, sweet-brier, etc.

Hedge′hog. [L. *Erinaceus.*] An insectivorous animal, with the power of rolling itself into a ball, and with its hairs developed into sharp, strong spines. Few animals care to attack it, and those that do are usually driven off by the armor of spines. Fourteen species are found throughout Europe, Africa, and most of Asia. The common hedgehog is about 9 or 10 inches long, the spines on the back measuring about an inch. It is nocturnal in its habits, hibernates, and feeds

on insects, mice, and worms. It is useful in a garden, and has been rendered domestic, and used to destroy cockroaches.

Hel′met. [AS. *helan*, to cover.] A head covering formerly largely in use as a defensive armor. It is now chiefly used for ornament, but firemen wear it as a protection from falling materials at fires, and in hot countries helmets of white felt covered with rolls of linen are worn as a protection against the sun's rays.

Hem′atite. An abundant and valuable ore of iron, the sesqui-oxide. Vast quantities of it exist in the United States, especially in Michigan and Missouri. In the latter, two mountains, Pilot Knob and Iron Mountain, consist chiefly of this ore.

Hem′lock. [A S. *hemleac.*] A plant of the genus *Conium*, whose leaves and root are poisonous. The common or spotted hemlock is from 2 to 7 feet in height, and grows by waysides and on heaps of rubbish. It is common in Europe and in some parts of Asia, and is now also a naturalized plant in North America and Chili. A valuable medicine is obtained from the leaves and fruit. *Water hemlock* grows in ditches, on the margins of ponds and on wet grounds in Europe and the north of Asia. It is a very poisonous plant, and is the cause of many deaths. *Hemlock spruce* is an evergreen cone-bearing tree, common in North America. It is a beautiful tree, often growing to the height of 100 feet. The bark is largely used in tanning leather.

Hemp. [AS. *henep.*] A fibrous plant of the genus *Cannabis*. It is cultivated in many parts of the world, but most largely in Poland and in the centre and south of European Russia. Hemp varies from 4 to 12 feet in height. The stem is hollow or filled with pith, and the bark contains a useful fibre, which is extracted and used for making canvas, ropes, sail-cloth, bagging, and other articles. The seed is often used to feed poultry and small birds, and it also yields an oil very good for burning, and also a narcotic resin called *hasheesh*.

Herb. A plant with a soft stalk, and which bears flowers and fruit only once, and then dies. Some live one year only, others two or more years.

Herba′rium. [L. *herba*, a plant.] A collection of specimens of plants, carefully dried and preserved. These collections are very valuable for the scientific study of plants, and there are some in existence which are centuries old.

Her′on. [Fr.] The name of a large tribe of wading birds found in almost every part of the globe. The body is small in proportion to the length of the neck and the legs. The legs are very long and slender, and the bill is longer than the head, and comes to a sharp point. Herons feed mostly on fish, frogs, crabs, and other water animals. These they greedily devour. They build their nests in high trees near the water, and feed their young with fish until they are old enough to care for themselves. The European heron is remarkable for its directly-ascending flight, and was formerly hunted with the larger falcons.

Her'ring. (*Clupea harengus.*) [AS. *hæring*, from the root *here*, an army.] A well-known sea food-fish. Herrings are found on the shores of the North Sea, the North Atlantic, the Baltic, and the White Sea. They approach the coast every spring in order to spawn, and then the great herring-fishing season commences. They move about in immense schools—the main body often divided into columns of from five to six miles in length and from three to four in breadth—swimming near the top of the water, and followed by multitudes of larger fishes and by gulls, fish-hawks, and other sea-birds, which feed on them. Drift-nets are employed in catching herring. These are let out from boats, usually in the evening; and when the fish are taken to the shore they are cleaned, salted, and packed in barrels. The fish locally known as herring in the American rivers south of Maine is the alewife, of the same genus as the shad. It is very abundant and much esteemed. There is also a Pacific herring whose abundance resembles that of the Atlantic species, and whose fishing is of growing importance.

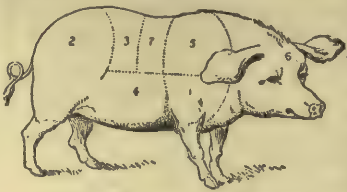
Hick'ory. A tree belonging to the Walnut family, found only in North America. The wood is tough and elastic, and is largely used to make hoops for casks. Handspikes, carriage shafts, wheel spokes, handles of axes and golf clubs, large screws, etc., are made of it. The trunk is slender and has a very rough bark, and the tree grows to a height of from 60 to 100 feet. The *hickory-nut* has a delicious flavor. One southern species yields the esteemed *pecan-nut*, others yield the *pig-nut*, *bitter-nut*, and *mocker-nut*.

Hieroglyph'ics. The name applied to the ancient Egyptian writing, in which the forms of animals and natural objects stand for words, and sometimes for syllables or letters. Chinese writing is similar in character, and all systems of writing are thought to have begun with hieroglyphics.

Hippopotamus. [Gk. *hippos*, a horse; and *potamos*, a river.] A large animal about 12 feet in length and 5 feet high at the shoulders, with short legs and four toes on each foot, a skin on the back and sides more than two inches thick—of dark-brown color and destitute of hair. It is found only in Africa, and lives mostly in lakes and rivers, and can remain a long time under water. At night it comes up on the banks of rivers, and feeds on plants and herbage. It lives in herds of from twenty to forty individuals. The hippopotamus is much hunted by the Africans for its flesh, of which many of them are very fond. The hide is converted into shields, helmets, whips, and canes, and the large canine teeth are much valued for their ivory, and form a very considerable article of African commerce.

Hive. [AS. *hyfe.*] See *Bee.*

Hog. The common name of the animal also called pig, and collectively *swine*. The eyes of the hog are very small and sunken, his nose is mobile, his form without beauty, his motions clumsy, and his appearance slothful and stupid. The hog is highly prized for its flesh, which supplies a chief article of food to many nations in the form of pork, bacon, ham, sausage, etc. Its fat is made into lard, its skin into leather for the saddler and trunk-maker, and its bristles are largely used in the manufacture of brushes. Wild hogs are common in many countries, and are hunted in various places. They are dangerous on account of their expert use of their tusks or long canine teeth. Wart-hogs have large lobes on each side of the face, and remarkably modified teeth. The African river-hog is of a gray color, and the West African red river-hog is remarkable for vivid coloring and long pencilled ears.



1 SHOULDER 4 BRISKET
2 LEG AND HAM 5 SPARE-RIB
3 HIND LOIN 6 HEAD
7 FORE LOIN

Hogs'head. Formerly a measure of capacity in use in England, containing 63 wine gallons and 54 ale gallons. In the United States the measure is still in use, and the term there signifies a large cask containing from 110 to 140 wine gallons.

Hol'ly. [AS.] A shrub or tree with shining, prickly, and smooth and wavy leaves and scarlet berries. The common holly grows in Europe, and in some parts of Asia. It is largely used for hedges, and forms an excellent fence. The American holly is found along the coast of the United States. It grows to be a tree of considerable size. The wood of both kinds is very hard, fine-grained, and almost as white as ivory, and is much used by cabinetmakers, turners, and musical instrument makers. The bark yields a substance from which bird-lime is made, and is used as a febrifuge, while the berries are a violent purgative. Branches of holly are largely used at Christmas for decoration. The Brazilian or Paraguay holly yields leaves from which the *mate* or *Paraguay tea* is made. It is more exciting than ordinary tea, and if taken to excess produces a kind of intoxication.

Holly'hock. [AS. *holihoc.*] A well-known hardy plant, the *Althæa rosea*, cultivated in gardens for its spikes of large and beautiful flowers. It is called also *rose-mallow*.

Hom'iny. [W. Ind.] Maize hulled and crushed; prepared for food by boiling in water.

Hone. [AS. *han.*] A hard stone of very fine grit, used in sharpening knives, razors, and various sharp-edged tools. The best stone for hones is found in Arkansas and Turkey, and when in use is wet with oil. Coarser hones are usually called *whetstones*, and are wet with water.

Hon'ey. [AS. *hunig.*] A very sweet substance collected by honey-bees from the juices in the flowers of plants, and deposited in the cells of the honeycomb. Heather honey is of a rich yellow color. Narbonne honey is white, and is made from rosemary flowers. The fine aroma of Maltese honey is due to orange blossoms. In the United States the finest is from forests of

basswood and white-clover pastures; also honey from buckwheat is abundant. Honey is largely used as an article of food, in sweetmeats, in some kinds of ale, and also as a flavoring in medicines. The old intoxicating drink called mead was made from honey.

Hon′eysuckle. A genus of flowering and climbing plants or shrubs, often planted in shrubberies and trained against walls on account of the beauty and delicious fragrance of their flowers.

Hoof. [AS. *hof.*] The horny substance which incases the feet of horses, cows, sheep, etc. Horses' hoofs, which are harder, are made into glue and ground up for artificial manure. Prussiate of potash, used for making Prussian blue for dyeing and calico printing, is made from horses' hoofs. (See *Horn.*)

Hop. [Du. *hop.*] A well-known climbing plant, very extensively cultivated in the south-east of England. It is a native of Europe, and is now grown in the United States and in Australia and New Zealand. It is largely grown in some of the American States, especially in New York. The plant is cultivated for its flowers, which are gathered or picked dried in kilns, bleached with sulphuric acid, and then used in making beer. They give it a bitter taste, and help to make it bright and clear. *Hop bitters* are used as a tonic.

Hore′hound. [AS. *harhune.*] A small plant with whitish stem and flowers. It has an aromatic smell, and is a popular remedy in cases of coughs and asthma.

Hori′zon. [Gk. *horizon.*] A circular line touching the earth, and formed by the apparent meeting of the earth and sky. This is called the *visible* or *sensible horizon*, while the great circle parallel to the sensible horizon, and passing through the earth's centre, is the *rational* or *celestial horizon*.

Horn. [AS.] A hard substance, usually of considerable length, growing on the heads of some animals, and also as the hoofs, claws, or nails of animals generally. The horns of the Ox family are never shed; the antler of the deer is bone, and is shed annually. Horn is a tough, flexible, semi-transparent substance, and is softened by heat. It is composed of thickened albumen, with small portions of gelatine and phosphate of lime. Horn when heated may be moulded into almost any shape, which it will keep when cold. The horns of the ox, cow, bison, buffalo, sheep, goat, and antelope are made into many highly ornamental and useful articles—such as handles for knives, forks, umbrellas, and walking-sticks; also into spoons, snuff-boxes, buttons, etc. Combs are made from flattened sheets of horn, which are got after the horn has been steeped in water for a considerable time.

Horn′bill. A bird of ungainly appearance, with large bill, helmet crowned, and found in India and Africa. By curious habit the male bird plasters the female in the hole of a hollow tree during nesting time.

Horn or **French Horn**. One of the most important of wind musical instruments, much used in orchestral music and in military bands. It gets its name from the first horns having been made of the horns of animals. It produces a soft and peculiar tone, due to the length of the tube, which is coiled up into several rings, and has a large bell-shaped end.

Horn′blende. A tough mineral of black color,

THE HORNBILL.

due to a large percentage of oxide of iron. It forms part of several rocks, as trap, syenite, and hornblende slate, which is excellent for flagstone purposes.

Hor′net. An insect belonging to the Wasp family, but much larger and stronger than the ordinary wasp, and whose sting gives severe pain. It is fully an inch in length. It forms its nest of a kind of paper-work made from bits of wood and bark, which it places in hollow trees and walls. It feeds on fruits, honey, and insects. Hornets, like bees, live in societies made up of males, females, and workers. The females and workers do all the work, and sting when disturbed. Their sting inflicts a painful wound, usually accompanied with considerable swelling. The best applications for it are grated potatoes and sweet oil.

Horn′pipe. An instrument of music formerly very common in Wales. It is also the name of a characteristic lively British dance much in favor among sailors.

Horse. [AS. *hors.*] A beautiful animal, useful for carrying loads or drawing wagons. It is a most intelligent animal, knows its master well, and if kindly treated will always do its work

willingly and cheerfully. The horse belongs to the genus *Equus*, which contains several species, including the horse, the ass, the quagga, and the zebra. Horses in a wild state are found in many countries, and are very numerous in South America. Almost every country has its own breed of horses, which is generally suited to the climate. The horses of Iceland are small, with thick shaggy hair. The Arabian horse is much larger, and is one of the finest of all breeds. The Barbary horse of Northern Africa is much like the Arabian, but smaller. The British horse, from which the best horses in the United States have come, has much Arabian and Barb blood in it. It resembles the Arabian in appearance, but is much taller and longer. The best trotting-horses are found in the United States and in Canada. Draught horses, or horses used in drawing heavy loads, are reared in many countries. The Percheron breed, common in France, has been noted for hundreds of years. They are large, heavy horses, with large heads, and are much used for drawing business wagons. The principal parts of the body of a horse are—(1) the chest, (2) the withers, (3) the barrel, or part enclosed by the ribs, (4) the flanks, (5) the loins, and (6) the buttocks. The age of a horse may be ascertained from an inspection of its teeth. Horses sometimes live 30 years, but the average age is from 15 to 16 years.

Horse-chest′nut. A large and ornamental tree, with large compound leaves, and bearing white flowers and a fruit or nut with a prickly shell. The nuts have a bitter taste, and are sometimes used as food for cattle. In some countries chestnuts are ground, and mixed with the food of horses; hence the name horse chestnut. They are also made into a strong paste for bookbinders and shoemakers, and in France and Switzerland they are used in cleaning woolens and in the washing and bleaching of linen. The bark of the tree is sometimes used in tanning leather.

Horse-power or **H.P.** The power of lifting 33,000 lbs. weight one foot high in a minute; it is entitled *indicated* or *nominal*.

Horse-rad′ish. A small plant with a stem about two feet high, but having a deeply-penetrating root, for which it is chiefly cultivated, and from which a highly valuable seasoning, of strongly acrid taste, is obtained.

Horse-shoe. A shoe for horses, consisting of a plate of iron of a circular form. Horse-shoes are necessary as a protection to the foot on stony or hard roads, and they vary in size, shape, and strength according to the formation of the foot and the kind of work the horse has to perform. They were formerly all made by the hand, and many still are, but machinery is now largely employed in their manufacture. Modern farriery requires light, small shoes, with few nails, and that the shoe be put on without overheating, which is cruel, and injures the horn.

Ho′siery. A name given to hose or stockings, and used now to include all kinds of knitted articles. Stocking-knitting was all done by the hand, until William Lee, of Woodbridge, in Nottinghamshire, invented a knitting-frame. Many additions and improvements have since been made, so that now not only stockings and socks but nearly all articles of hosiery are made by a knitting-frame of one kind or other.

Hos′pital. [Fr., from L. *hospitalia*, apartments for strangers.] A building used for the reception of sick persons, or for those who are unable to supply their own wants. Some hospitals are set apart entirely for the treatment of those suffering from disease, others for incurables; some for the education of children, and others as homes for the poor and helpless. Naval and military hospitals are provided in all countries for the care of sailors and soldiers.

Hos′tage. [Fr. *Otage*.] A person left with an enemy or hostile power as a pledge to secure the performance of the articles or conditions of a treaty.

Hot-House. A building warmed by stoves or furnaces for rearing exotics or tender plants. A *hot-bed* is a garden bed covered with glass, to rear plants early in the season by the heat of the sun.

Hound. [AS.] A dog used for hunting. The bloodhound, staghound, and foxhound hunt only by scent, and may be termed true hounds. To this class may be added the harrier and the beagle; but the greyhound and the deerhound run by sight alone, and strictly speaking are not true hounds.

Hour. [Fr., from L. *hora*, an hour.]. A space of time equal to 60 minutes, or to 1-24th part of a day. The hours of the civil day begin at midnight. Since 1885 the hours of the astronomical day begin at midnight, and are counted from 0 to 24.

Hour′-glass. A kind of chronometer or instrument for measuring intervals of time. It is constructed of glass, and consists of two bulbs, one above the other, connected by a narrow neck. The time is measured by the running of dry sand from the one bulb to the other, the quantity being adjusted to the time which each glass has been constructed to indicate. In the case of an hour-glass, as much sand is placed in one bulb as will take an hour to pass from it to the other. Hour-glasses were very much in use in churches during the 16th and 17th centuries, and specimens of very fine workmanship are still to be seen in several churches in England. (See *Log*.)

Huck′aback. A kind of linen with raised figures on it, used for table-cloths and towels.

Huck′leberry. A shrub of the Heath family which grows wild over most of the United States, and yields a palatable berry. There are several kinds, some being low bushes, while the swamp blueberry grows several feet high, and bears a much larger berry. The billberry is the same as the blueberry. (See *Whortleberry*.)

Hum′ble-bee. [Ger. *hummel*.] It is often called *bumble-bee*. (See *Bee*.)

Hum′ming-bird. The smallest and most beautiful of all birds, found only in America, and almost exclusively tropical. They get their name from the peculiar humming noise made by the rapid vibration of their wings. The muscles of their

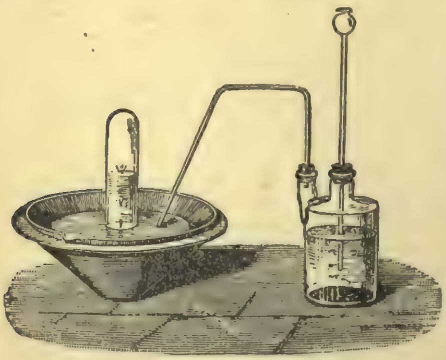
wings are very strong. This enables them to fly with great swiftness, and to hover over a flower while they capture the minute insects in it and perhaps sip the nectareous juices. They do not sing, having only a kind of shrill chirp. Their nests are very pretty, made of mosses and lichens, and lined with cotton and any soft thing they can find. They are unsurpassed by any birds for their brilliant plumage, and some are ornamented with crests, tufts, or frills. Many fruitless attempts have been made to domesticate these beautiful birds.

Hur′dle. [AS. *hyrdel.*] Twigs, osiers, and sticks woven together; a frame of split timber or sticks for gates and fences.

Hy′acinth. [Gk. *hyakinthos*, an iris.] A plant with a large rounded root and a beautiful flower of different colors.

Hydrau′lics. The science of fluids in motion. Of its applications may be named the hydraulic ram, which pumps water by the force derived from a moving stream; the hydraulic or hydrostatic press, in which the pressure of a column of water exerts a powerful force; and the hydraulic engine, which is operated by water pressure.

Hy′drogen. [Gk. *hydor*, water; and the root of *gennao*, to produce.] The lightest of the chemical elements. Hydrogen is a colorless and, when



HRDROGEN GENERATOR.

pure, tasteless gas. It is very inflammable, gives little light, but its flame is one of the hottest known. It is never found alone, but is always present in water. Pure hydrogen gas is about 14½ times lighter than atmospheric air. It is generated by pouring dilute sulphuric acid upon zinc and collecting the gas in a receiver over water.

Hydrom′eter. [Gk. *hydor*, water; and *metrom*, a measure.] An instrument for measuring the weight of a liquid as compared with an equal amount of water.

Hye′na. [L. *hyena.*] A genus of carniverous quadrupeds, about the size of a large dog, and of fierce and almost untamable character. The back and neck of the hyena are covered with coarse, shaggy hair, forming a sort of mane. The hinder parts are lower than the fore parts, and it has a large head and ears. Hyenas live in caverns and rocky places, and at night prowl about in search of food, which generally consists of dead animals, but when very hungry whatever living

THE HYENA.

prey they can seize. The common or striped hyena is a native of Southern Asia, while the spotted hyena is found in Southern Africa.

Hydrop′athy. [Gr. *hydor*, water; and *paskein*, to suffer.] A mode of curing disease by the application of water. This is applied in various forms of the bath, also by enveloping the patient in a wet sheet. It has a bracing and tonic effect upon the system.

Hydropho′bia. [Gr. *hydor*, water; *fobos*, fear.] A disease caused by the bite of a rabid animal, and so called from the great dread which those who suffer from it have of water. Some doctors say that no such disease exists, the symptoms being due to fear and nervous excitement. Pasteur claims that it is a bacterial disease, and can be cured by inoculation with attenuated virus.

Hyp′notism. [Gr. *hypnos*, sleep.] The science of what was once called mesmerism and animal magnetism. The subject in a hypnotic state comes under the sole control of the operator, and acts under his suggestions, which seem reality to the patient. It is said that suggestions to perform a certain act at some future time will be obeyed, and in this way a criminal act might be done for which only the operator was responsible, the patient ceasing to be a free agent. Hypnotic suggestion is now used as a remedial agent, patients being induced to give up drinking, to cease other hurtful practices, to perform useful exercises or become diligent in study, etc. Also painful sensation is obviated, so that surgical operations can be performed without suffering.

I

Ice. [AS. *is*, *isa*.] Water freezes into ice when its temperature falls to the freezing-point, which is 32° on the Fahrenheit thermometer, and zero on the Centigrade. Ice forms on the surface of water, which expands in freezing—that is, any given quantity of water makes a larger volume of ice. The ice is therefore lighter than water, and this is the reason it floats. The expansion of water by freezing produces very remarkable effects on rocks and stones, splitting the rocks open and cracking the stones. Ice is found all the year round in the Polar regions, and on the tops of very high mountains. *Glaciers* are vast bodies of compressed snow and ice which move slowly down mountain sides. *Icebergs* are large masses which break away from glaciers on the Arctic coasts, and, falling into the water, float into warmer seas. Ice is now an important article of commerce, and is shipped in large quantities to warm countries, chiefly from the United States. Norway sends ice to Great Britain. Large quantities of ice are now made by freezing machines, in which cold is produced by chemical action.

Ichneu′mon. An animal of the Civet family, though it closely resembles the weasels in form and habits. It is about 18 inches long and very slender. It feeds on birds, rats, reptiles, etc., and, though destructive to poultry, is valued for its slaughter of snakes, and destruction of their eggs, of which it is very fond. It also digs up and sucks the crocodile's eggs, and on this account the Egyptians places it among their gods. *Ichneumon flies* are a family of insects which deposit their eggs in the bodies of other insects.

Igua′na. A reptile abundant in South America and the West Indies, of about 5 feet in length. It is of a green color with a bright yellow crest along the back. Though formidable in appearance, it is very timid, and is hunted for its delicate flesh, which tastes much like chicken.

In′cense. [L. *incensum*.] The perfume produced by the burning of spices and gums. It is the symbol of prayer in churches. The powder, made up of benzoin, storax, and other resins, cascarilla bark, etc., is placed in a silver vessel hung by chains. As it burns, the smoke escapes through little holes, and fills the church with sweet odors.

Inclined Plane. A sloping surface up which a weight can be pushed or rolled that could not be easily lifted. It is believed that the pyramids of Egypt were built by the use of great inclined planes, up which their heavy stones were dragged. It is now used on railroads in hilly countries and on many canals instead of locks, the boats being drawn up the sloping plane from one level to another.

In′cubator. [L. *Incubo*.] An apparatus for the artificial hatching of eggs, heat being applied instead of the natural warmth of the body. Several hundred eggs may be hatched in a single incubator.

India-rubber. The hardened juice of several kinds of trees, It is also known by the names *caoutchouc* and *elastic gum* or *resin*. The india-rubber of commerce comes chiefly from Mexico, South America, Madagascar, and the East Indies. The East Indian rubber is the juice of a kind of fig-tree, while the South American is that of the syringe-tree. A hole is made in the bark, and the juice is caught in a cup. It is pale yellow in color, and about as thick as cream, but when spread out it hardens and becomes nearly pure white. Previous to the beginning of this century india-rubber was used only for rubbing out pencil marks, but now its uses are very numerous. All kinds of elastic and waterproof goods are made from it. It is woven with silk, cotton, or woollen threads into a great number of fabrics. The discovery of the art of vulcanizing rubber by the addition of sulphur, which was made by Charles Goodyear, an American, in 1839, has largely added to its uses. Tubes, fire-hose, and gas-pipes, elastic rings or bands, door and window springs, mats, boots and shoes, machinery belts, and many other useful things are made out of vulcanized rubber, which does not soften in hot weather like common rubber. Hard rubber or ebonite is made out of india-rubber and sulphur heated much hotter than vulcanized rubber. Canes, combs, backs of brushes, buttons, surgical instruments, picture-frames, knife handles, and a great variety of other things are made from ebonite. India-rubber mixed with sulphur and coal tar makes a substance so hard and black that it resembles jet. This may be cut and polished and made into bracelets, breast-pins, sleeve-buttons, studs, watch-guards, and other useful and ornamental things.

Indian Corn. (See Maize.)

Indian Summer. A term applied in the United States to the period of mild weather which nearly always comes at the close of October, extending sometimes to the middle of November. It is rainless and the atmospere is apt to be hazy. In Europe a similar season is known as St. Martin's Summer.

In′digo. [L. *indicum*, from *India*.] A well-known and beautiful blue vegetable dye, obtained from the leaves of several species of plants which grow in the East and West Indies, India, Ceylon, Mexico, Brazil, Egypt, etc. Indigo is very extensively employed in dyeing and calico-printing. *White indigo*, discovered by Chevreul, results from the action of hydrogen on indigo. Indigo is made artificially in great quantities from *cinnamic* acid and *isatin*, which are derived from benzine.

Influen′za. An epidemic disease which comes suddenly, produces severe catarrh, and is very apt to develop into pneumonia or serious affections of other parts of the body. In France it is known as *la grippe*, which name has become common, and many occurrences of it are upon record, one of the most persistent of which

appeared in Europe and the United States in the winter of 1889–90, and was still active more than ten years later. The disease is believed to be of bacterial origin, and is often fatal.

Induc′tion. An important electrical phenomenon, in which a charged conductor causes unlike electricity to appear in an insulated conductor on the end near it, and like electricity on the other end. In the same way a magnet induces the opposite magnetic charge in iron, and an electric current induces a momentary current in the opposite direction in a neighboring wire. In practice, the induced current is often used instead of the primary current. In long telegraph wires and ocean cables induction acts to check the rapidity of movement of the current.

Ink. [Fr. *encre.*] A liquor or substance used for writing or printing. *Writing ink* is made of gall-nuts, sulphate of iron, gum, and water. *Copying ink* has more gum than writing ink; while *blue ink* is made of Prussian blue, oxalic acid, and water; and *red ink* is got from Brazil wood, but now generally from potassium eosin. *Black printing ink* is much thicker than writing ink, and is usually made of lamp black or ivory black mixed with burnt linseed oil.

Inlay′ing. The art of ornamenting flat surfaces with pieces of wood, ivory, pearl, precious metals, etc., by inserting them into spaces cut out of the body of the substance in which they are to be inlaid.

Insectiv′orous Plants. A name given to various plants whose leaves are developed into traps for catching insects, upon whose juices the plant seems to feed. Well-known forms of these are the Venus fly-trap, the sundew, and pitcher plants.

In′sects. [L. *insectus*, cut into.] In point of number and variety of species by far the largest class of animals. The body, made up of a number of rings or segments, is divided into three parts — the head, forming one ring; the thorax, with three divisions; and the abdomen, with eleven rings. The head has two jointed feelers, called *antennæ*, which are used in smelling and as organs of touch and guidance, and three pairs of mouth appendages. The first pair, called *mandibles*, is used for cutting the food. Next come the first pair of *maxillæ*, and below these the second pair of maxillæ.

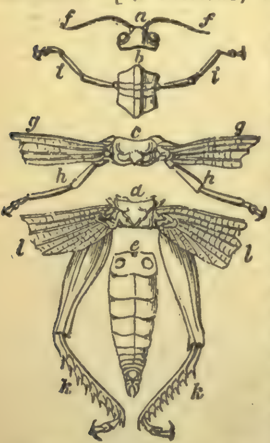


FIGURE SHOWING THE PARTS OF INSECTS.
a, head: *b c d*, thorax; *e* abdomen; *f f*, antennæ or feelers; *g g l l*, wings; *i i h h k k* legs.

Insects feed on different kinds of food, some living on animal and some on vegetable substances, while others suck juices. Hence arises a difference in the shape of their mouths—some being formed for biting and chewing, some only for sucking, and some for both. Three pairs of legs grow on the thorax, one pair on each ring; and they have usually either two or four wings also on the chest. The majority of insects are hatched from eggs, and these vary in number according to the kind of insect. Some kinds of insects, such as the hive-bee, the silk-moth, the cochineal and lac-insects, are very useful to man, other kinds, such as the locust, the grasshopper, the potato-bug, and many flies, are very harmful, destroying herbage and crops.

I′odine. [Gk. *ion*, a violet; and *eidos*, form.] A simple substance obtained from the ashes of sea-weed; its vapor is of a rich violet color. Though an irritant poison, it is used medicinally in small doses.

Ipecacuan′ha. [Peruvian *ipi*, root; and *Cacuanah*, the district from which it was first obtained.] A plant found in the forests of Brazil, the root of which is used as an emetic.

I′ron. [AS. *iren.*] The most common and most important of all metals. Iron possesses properties so varied and useful as to give it the highest rank among the mineral productions of the earth. It is very hard and yet malleable; can bear a great strain or be made very brittle; is inflexible, but from it the most elastic springs can be made; it may be used for the heavy sides of a man-of-war, or the slender blade of a surgeon's knife.

Native-Iron. Of this there are two kinds:—1 *Telluric iron*, found in small grains in some basaltic rocks, and generally associated with other metals. 2. *Meteoric iron*—that is, masses of nearly pure iron which have fallen from outer space to the earth in the form of meteors. Some of these masses are of great weight, one found in 1871 near Disco Bay in Greenland weighing nearly 20 tons.

Iron Ores.—Iron is found chiefly in the earth's crust in combination with oxygen. There are several kinds of ores from which iron is made, but the most important are the various oxides, the carbonates, and the sulphides. From the two former almost all the iron of commerce is obtained. *Magnetic ore* is the richest of all the ores, and from it are made the finest iron and the best steel. It is found in large masses in Sweden, Norway, Russia, and North America, and in some parts of England. Some specimens of this ore form natural magnets. Magnetic ore when pure contains fully 72 per cent. of metallic iron. *Hematite ore* in its pure state contains about 70 per cent of iron. This ore is found in great abundance in Chili and other parts of South America, in Algeria, England, Norway, Sweden, and in large beds in Canada, Pennsylvania, Missouri, Michigan, Wisconsin and Wyoming. In addition to the ores mentioned there are many other kinds, such as *brown ore*, *bog ore* or *limonite*, *spathic ore*, etc.

Cast-iron, or pig-iron, as it is commonly called, is made by smelting or melting iron ore in a blast furnace. Iron smelting is necessary to free the ore from all foreign ingredients, to reduce

the iron oxide to metallic iron, and to allow the reduced iron to combine with such an amount of carbon as to form therewith a fusible compound. Cast iron is used for making gas and water pipes, lampposts, pillars and fronts for buildings, railings and many other things. It contains from 3 to 6 per cent. of carbon, and cannot be hammered, as it is brittle. To make it into *wrought iron*—that is, softer iron which can be hammered or rolled into plates—the cast iron is melted in another kind of furnace, and stirred up so that the air can get to it. In this way the carbon is burned out, and it contains only ½ per cent. of carbon. Wrought iron is easily hammered into bars, rolled into plates, drawn out into wire, or made into *steel*. Iron plates for steam boilers and ships, anchors, chain cables, ploughs, wheel-tires, horseshoes, shovels and spades, nails and spikes, wire, the iron part of most tools, etc., are made from it. Pieces of wrought iron can be welded or joined into one by hammering them together when red hot. (See *Steel.*)

Irriga′tion. The watering of the earth to increase its fertility. The word is applied to flooding fields directly from streams, and to the digging of long canals and ditches to spread the waters of a stream over a broad section of land. It was practiced in very early times by the Egyptians and Babylonians, and is now much in use in many parts of the earth. It is being widely applied in the Western United States.

I′singlass or **Fish-glue.** [Corrupted from Du. *huizenblas*, the bladder of the sturgeon.] A substance consisting chiefly of gelatine, prepared from the sounds or air-bladders of certain fresh-water fishes. The finest is obtained from the sturgeon, which is very plentiful in the Caspian and Black seas and the rivers flowing into them; but isinglass is also made from the bladders of the cod and other fish, and quantities are produced in Brazil, North America, and the East Indies. It is much used in making jellies, ices and other kind of desserts, and in clarifying beer. It is the chief substance of Russian glue, noted for its strength, and used in stiffening linens, silks, gauzes, etc. Isinglass dissolved in acetic acid is a useful cement for repairing glass, pottery, etc.

Isother′mal. Having equal heat or temperature. Isothermal lines are those which pass through points of equal annual temperature upon the earth's surface. They are irregular in shape, the temperature of a place being not closely governed by its latitude. Thus in passing from western Europe to eastern America the lines may differ 10 or 11 degrees in latitude. In crossing the United States they reach higher latitudes on the Pacific than on the Atlantic coast.

I′vory. [Fr., from L. *ebur*, ivory.] The hard, fine-grained substance of a fine white color obtained from the tusks and teeth of the elephant. The name is also given to the tusks and teeth of certain other animals, as the hippopotamus, walrus, narwhal, etc. The tusks of the African elephant yield the best ivory, on account of their superior density and whiteness. They are of all sizes, but the largest weigh from 180 to 200 lbs. Indian and Ceylon elephants also yield much ivory, but the ivory used by Russian ivory-workers is that of mammoths found buried in the soil of Northern Siberia. Ivory is used in the manufacture of knife-handles, billiard balls, chess-men, dice, fans, combs, paper-knives, napkin-rings, brooches, organ and pianoforte keys, etc. Great taste and skill are often shown in working ivory, and some of the carved boxes, ornaments, and toys made of it are very beautiful. The Chinese and Japanese are very skilful in carving ivory. Ivory obtained from the hippopotamus is very white, and not grained like that of the elephant, and is used by dentists for making artificial teeth.

Vegetable ivory is the nut of a palm-like tree which grows on the plains of Peru, and on the banks of many of the rivers of South America. The nuts, about the size of hens' eggs, are exceedingly hard and white when ripe, and resemble ivory so much that they are used in the manufacture of buttons, umbrella handles, and small trinkets.

I′vy. [AS. *ifig.*] An evergreen plant of the genus *Hedera*, which creeps along the ground or climbs trees, rocks, walls, etc. Its leaves are very pretty, of a dark-green color, smooth and shiny. It is found almost throughout the whole of Europe, and especially in Great Britain. In North America it does not succeed very well, but on the Pacific coast it grows luxuriantly, and it is popular in Virginia and some of the Southern States. Various substances are got from the different parts of the plant. The stem yields a gum resin and the seeds a bitter substance called *hederin*. *Poison ivy* is a poisonous, climbing plant of the Sumach family. It is common on trees, etc.

J

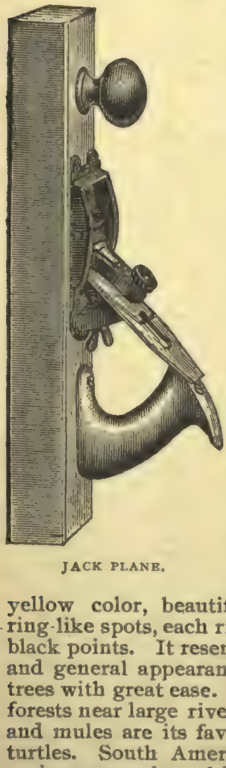
Jack. A hoisting or lifting device, consisting of a screw arrangement by which a heavy weight may be lifted with small power. The hydraulic jack is the most powerful of lifting machines. In its use water is forced through a small hole into a chamber of considerable dimensions. By its aid a man may lift 10 tons 1 foot in a minute and a half, or 100 tons in 15 minutes. The term jack is applied to many other tools used in the arts.

Jack′al. This animal belongs to the genus *Canis*, and has a close resemblance to the dog and the fox. The common jackal is of a grayish-yellow color, about 3 feet in length and 14 inches in height, with short ears and small eyes. Jackals sleep during the day in holes and burrows, and go out at night to hunt in packs, sometimes more than a hundred together. They keep up a constant howling, making the night hideous in the

regions where they abound. Their food consists chiefly of carrion and decaying matter, but they also enter houses or tents, and are the pests of the poultryyard. The common jackal is found in Africa, from Barbary southwards to the Cape of Good Hope, and in Persia, Syria, and the southern regions of Asia. The striped jackal, the jackal-wolf, and the black-backed jackal are different species, all found in Africa.

Jack′daw. [*Jack* and *daw.*] A bird of the crow kind, smaller than the rook and carrion crow, in length about 12 inches. Its plumage is of a glossy black, and it has a short black bill and black legs. It is common in the British Islands, and is found over nearly all Europe, also in Asia and the north of Africa, but not in America. It builds its nest in cliffs, ruins, towers, and elevated situations, and in chimneys and in hollow trees. Its food consists of worms, snails, and insects. Jackdaws lay from five to six eggs of a greenish color, covered with small dark-brown spots. They are easily domesticated, and soon become familiar and imitate the human voice.

Jack Plane. A Carpenter's cutting and surface smoothing tool, from 12 to 17 inches in length and used to take off the roughest surface of the board.



JACK PLANE.

Jac′onet. A light soft muslin, used for dresses neckcloths, etc.

Jade. [Span. *ijada*, flank.] A mineral, called also *oxstone*, of a greenish color, compact, and with a fatty lustre. It was believed to cure pain of the *side*, hence its name. Chinese jade is wrought into beautiful vases and other objects.

Jag′uar. A large and ferocious animal, of the cat family, found chiefly in South America, and often called the American tiger. It is found in North America as far north as the borders of Texas. It is larger than the leopard and is very strong. Its fur is of a brownish-yellow color, beautifully marked with dark ring-like spots, each ring enclosing several small black points. It resembles the leopard in color and general appearance, and, like it, can climb trees with great ease. The jaguar lives in thick forests near large rivers and lakes. Wild horses and mules are its favorite prey, and it feeds on turtles. South Americans hunt the jaguar in various ways, but chiefly with the aid of dogs and the *lasso*. Jaguar skins are very handsome, and are largely imported into Europe, and made into valuable robes, etc. It will not attack man unless impelled by hunger, or self-defense.

Jal′ap or Julep. [So called from *Jalapa* in Mexico.] (*Rose-water.*) The root of a plant much used in medicine as a purgative.

Japan′ning. The art of covering wood, metal, leather, paper, etc., with a thick coating of colored varnish. It was first practised by the Japanese, hence the name. Tea-trays, tin canisters, cash-boxes, coal-boxes, etc., are japanned in iron and tin works in large cities.

Jas′mine. A genus of long twining shrubs, bearing sweetly-scented flowers.

Jas′per. [Gk. *iaspis.*] A hard precious stone of various colors (usually red or brown), which takes on a high polish, and is used for rings, seals, vases, and other ornaments, and also for the decoration of costly buildings. It is one of the varieties of quartz, and is found in veins and embedded masses in many rocks.

Jaun′dice. [Fr. *jaunisse.*] A disorder of the liver, causing bile to mix with the blood, when the skin becomes yellow.

Jay. (*Garrulus.*) A genus of short-winged birds of the Crow family. The jay frightens small birds with its cry, and robs nests of their eggs. The European jay is of a yellowish-brown color, and resembles an ordinary pigeon in size. Its food consists chiefly of berries, seeds, fruits, and nuts, but it is also fond of worms, insects, and young mice. The American jay, or blue jay, has a far more brilliant plumage than the European jay, with a crest of feathers. The Florida jay is blue. The Canada jay is plain colored, and without a crest.

Jel′ly. A translucent juice which thickens when cold into a soft and trembling mass. The juice of currants and some other fruits thickens to jelly after boiling with sugar. A jelly is also made from Iceland moss, and there are various jellies made from animal substances,—as calves' foot jelly.

Jel′ly-fish. (*Medusæ.*) Soft-bodied ocean animals, which form a disk of an umbrella shape, with a mouth in its centre, opening downwards, and long tentacles surrounding the mouth or depending from the margin of the disk. They have stinging powers, and move by opening and shutting the umbrella disk. Their flesh resembles jelly, some of them being small and transparent, others quite large.

Jer′boa or Jumping Mouse. (*Dipus.*) A genus of rodent mammals allied to the mouse, having very short fore legs and remarkably long hind ones, and noted for their power of jumping by the aid of a long muscular tail. The average length of the body is about 8 inches, the tail often measuring 10 inches. They are common in Asia and Northern Africa, and a few species are found in Russia and North America. They live in burrows, are nocturnal in their habits, and hibernate.

Jeru′salem-ar′tichoke. [*Jerusalem*, corruption of Ital. *girasole*, or sunflower.] A plant whose root is sometimes used for food.

Jet. [From *Gagas*, a town in Asia Minor.] A hard black mineral, easily cut and carved, and capable of receiving a very beautiful polish. Jet

appears to be a kind of bituminous coal, but much harder and smoother than that used for burning. Much of it is found near Whitby, Yorkshire, where it has been worked for centuries. It is made into buttons, mantel ornaments, necklaces, earrings, brooches, bracelets, and other trinkets. Jet is also found in France and Spain, and in these countries it is made into rosary beads, crosses, etc. Sometimes called *black amber*.

Jet′ty. A landing-place carried out so far that vessels may discharge their cargoes at all states of the tide; a breakwater for the protection of river or harbor mouths. Jetties are built out in pairs into the ocean so as to confine the outflow

JERBOA OR JUMPING MICE.

of streams and prevent the formation of bars. The Mississippi jetties, begun in 1875, deepened the South Pass of that stream from 14½ to 23 feet, the confined water sweeping the mud from the bottom.

Jew′el. [Fr.] Any ornament of precious stone, metal, or other valuable material. A diamond or other stone in a watch on which the pivot turns.

Jew's-harp. A simple instrument of music, made of metal, and shaped like a harp. When played it is placed between the teeth, and by means of a little spring, which is made to vibrate by being struck with the finger, it produces a sound which is modulated by the breath of the performer into soft melody. Also called *Jew's-trump*.

Johan′nisberger. The finest kind of Rhine wine, made at Johannisberg monastery.

John-dory. [*John*, and Fr. *dorer*, to gild.] A flat sea-fish of a golden-yellow color, with a small round spot on each side; hence called *St. Peter's Fish*.

Joists. [Fr., to lie.] Pieces of timber, laid horizontally in parallel rows, resting on walls and girders, and sometimes on both, and to which the boards of a floor or the laths of a ceiling are nailed.

Jol′ly-boat. A small boat belonging to a ship.

Jour′nal. [Fr. *journal*.] A diary; a book containing an account of daily transactions and events; a *business* book in which every particular article or charge is entered; a paper published daily or at regular times.

Ju′jube. The name of a small tree or shrub and of its fruit, sometimes called lotus. The tree is a native of Syria, and is now cultivated in many parts of Asia and in Europe, chiefly for its fruit, which is dried as a sweetmeat. The common jujube paste is really a mixture of gum arabic and sugar, slightly colored.

Ju′niper. [L. *juniperus*.] A hardy evergreen tree or shrub, with dark-purple berries, which have a strong and peculiar flavor, and are much used for flavoring gin. The common juniper is found in Europe, the north of Asia, and the northern parts of North America. It attains no great height, being in general only a shrub from 2 to 6 feet high, but in favorable circumstances it becomes a tree from 15 to 30 feet in height. The fruit takes two years to ripen. *Virginian juniper*, or the red cedar of North America, attains a height of from 30 to 50 feet; and the wood, which is of a beautiful red color, is highly prized by turners, and is also largely used for cigar-boxes and lead pencils.

Ju′piter. The largest planet of the solar system. It is about 88,000 miles diameter, eleven times that of the earth, and rotates in less than 10 hours, its surface at the equator moving 28 times as fast as the earth's surface. Its distance from the sun is 485,000,000 miles.

Jute. The fibre of the inner bark of two plants, which are very extensively cultivated in India, especially in Bengal. Both plants are annuals, in height from 10 to 14 feet, with yellow flowers and smooth leaves. The stem is erect, smooth, and cylindrical, and the inner bark is separated from it by steeping in water. The fibre is of a yellow or buff color, comparatively strong, easily spun, and possessing a shining surface. It is largely used for making coarse cloth for bagging and sacks, and in the manufacture of carpets, tarpaulin, backings for floorcloth, manilla paper, etc. Jute has been woven into various fabrics in Bengal from a remote period, and there are now many jute factories in India. (See *Gunny*.)

K

Kalei′doscope. [Gk. *kalos*, beautiful; *eidos*, a form; and *skopein*, to see.] An optical instrument invented by Sir David Brewster in 1817. It consists of a tube containing two glass mirrors, making an angle of 60° with one another, and extending the whole length of the tube. One end of the tube has a small opening to serve as an eye-glass, and the other end has two glasses, one of ground and the other of clear glass, with little pieces of colored glass lying loosely between

them. These colored bits of glass are reflected in the looking-glasses, and regular figures of the most beautiful form, which change whenever the instrument is shaken, are seen on looking through the instrument. It forms a cheap and pretty toy, and is also used, in a more expensive form, by pattern-drawers and others, who get from it an endless variety of designs.

Kan′garoo. An animal belonging to the Marsupial order of mammals, and found only in Australia, New Guinea, and the neighboring islands. Its distinguishing features are very short fore legs, which are not used for walking, remarkably long hind legs, by means of which it makes long leaps, and a pouch in which it carries its young for a certain period after birth. The kangaroo has a long, thick, and strong tail, and when resting and feeding it supports itself on its hind legs and its tail. Kangaroos live on vegetable food, mainly grass, which they consume in large quantities, two kangaroos eating as much grass as three sheep. They are hunted in various ways, chiefly by dogs, upon which they turn and strike heavy blows with their tails. The skin is much prized, and makes a valuable leather for shoes and gloves; and the flesh is largely eaten by the natives in Australia, and is said to be nutritious and to resemble mutton.

Ka′olin. A pure white clay, resulting from the decomposition of felspar in granite rocks. The finer kinds of porcelain are made from it.

Kelp. A dark-gray powder or ash, got by burning seaweed, used chiefly in the manufacture of iodine, and formerly of glass.

Kes′trel. A small bird of the genus *Falco* or hawk kind, like the sparrow-hawk.

Kid′neys. Two peculiarly-shaped glands which secrete the urine from the blood and send it into the bladder. In the human body they are situated one on each side of the abdominal cavity, and are spoken of as the right and left kidney. Their average length is fully 4 inches, and they weigh from 4 to 6 ounces each.

Kin′dergarten. [Ger. *kinder*, children; and *garten*, a garden.] A school or training-place for young children, in which instruction is given by means of games and other amusements; so called because first carried on in rooms opening on a garden. The system was devised by Friedrich Froebel in 1826. Since that time it has been gradually developing and extending.

Kine′toscope. An apparatus for taking and afterwards exhibiting a rapid series of photographs of moving scenes. By its use life-like pictures can be displayed. Various names have been given to modifications of this instrument, as Biograph, Vitascope, Mutoscope, etc., all based on the one principle.

King′bird. Also known as the Tyrant Fly-catcher and Bel-martin. It is found only in America east of the Rocky Mountains, and during the nesting season is very fierce. It will attack the largest bird that comes too near its nest, even eagles and hawks being driven off by this little tyrant. It will dart upward, alight on the back of its enemy, and with its sharp beak make him suffer for his temerity.

King′fisher. A genus of perching birds noted for their brilliant plumage. The kingfisher is usually found alone, perched on the bough of a tree on the banks of rivers. Here it will sit for hours watching for fish. It dives the moment it perceives its prey, carries the fish to the perch, kills it, and swallows it whole. The kingfisher makes its nest of fish-bones, ejected by the bird itself. It is found all over the world. The wood kingfisher of Africa feeds largely upon insects, snails, and fishes. The belted kingfisher of North America is slate-blue, with white breast, and feeds on fishes. The giant kingfisher of Australia feeds on lizards and insects.

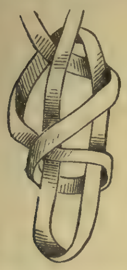
Kite. [AS. *cyta.*] The name of a very active bird of the genus *Falco* or hawk. Its bill is short and strong, its wings are long, powerful, and pointed, and its tail is forked. The kite spends the greater part of the day on the wing, sometimes flying so high that it can scarcely be seen, and coming down at night to roost on tall trees. When in the air it lives mostly on insects, but its food consists also of moles, mice and carrion. The common kite and the black kite are found throughout Europe; the swallow-tailed kite is common in America. The carrion-feeding habits of this bird are seen to perfection in the birds found in Asia, and particularly in India.

Kite. A light frame of wood and paper constructed for flying in the air, chiefly for amusement. Kites get their name from the kind of hawk called kite, which has just been described, and which is often seen in the air, almost as still as a paper kite, gliding along without moving its wings. Kites are made of many different shapes, but the most common are the cross-kite, the house-kite, and the bow-kite. The natives of India, the Chinese, and the Japanese are very skilful in making kites, and often make them to represent animals, ships, castles, trees, and flowers. Kites are used to carry lines across deep chasms or over the tops of steeples and high chimney-stacks, and are now employed in the study of the weather, being sent very high into the air.

Kit′tiwake. A bird of the gull kind.

Knife. [AS. *cnif.*] Primitive men used shells, flints, and sharp-edged stones for knives. These

were followed by bronze knives made of copper and tin; but knives made of iron and steel gradually took their place, as they were found to be more lasting and stronger. The best knives are now made of steel. In the manufacture of table-knives a bar of shear-steel is heated white hot and then hammered into shape on an anvil. This is called forging the blade. Penknife and razor-blades are made of cast steel. After forging, the blades are stamped with the maker's name, and then tempered by heating them red hot and cooling them quickly by dipping them in water. They are then ground and polished and fitted with handles.



CROSSED SLIP-KNOTS.

Knight. A title of honor, originally adopted during the feudal system, and given to soldiers of courage and experience. The knight took the title of Sir before his name. Knighthood was conferred of old by laying the blade of a sword on the shoulder of the one to be honored and repeating a formula declaring him a knight. There were several Orders of Knighthood. Knighthood is now a civil, not a military, rank.

Knot. In nautical language a division of the log-line serving to measure the rate of a vessel's motion. The log-line is divided by knots into sections, and the number of sections which run off in half a minute show the number of geographical miles or knots per hour at which the vessel is going. A geographical mile or knot is 6,086 feet, while an English statute mile is 5,280 feet. (See *Log*.)

Knots. There is an almost endless variety of knots, most of them in use on board ship, though different occupations using ropes, cordage, etc. have special kinds of knots. Knots used by sailors differ in form, size, and name according to their varied uses; as the diamond-knot, over-hand-knot, bowline-knot, buoyrope-knot, reef-knot, shroud-knot, stopper-knot, etc.

SAILORS-KNOT.

Ko'dak. A form of photographic camera adapted to take instantaneous negatives by the "snap-shot" process. It is made in the form of a small box, with a lens and shutter on one side, and a reflector on top to aid the operator. The negative is taken by pressing a button, which opens the shutter for an instant. (See *Camera*.)

Kou'miss. A fermented drink made from mare's milk originally, though it may be made from the milk of any animal. The article usually sold under this name is made from cow's milk, yeast being used to cause it to ferment. It is esteemed a nutritious beverage and an aid to digestion.

L

La'bel. A narrow slip of silk, paper, metal, or parchment, containing a name or title, and affixed to anything, to tell what or whose the thing is.

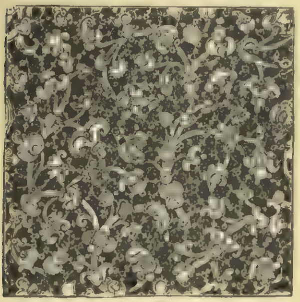
Labur'num. A small tree, a native of the Alps, much planted in shrubberies and pleasure-grounds on account of its glossy leaves and clusters of beautiful yellow flowers. The laburnum is a very hardy tree, and though of rapid growth its wood is hard, fine-grained, and very durable, and is highly valued by cabinetmakers and turners. It is used also for wedges, pulleys, pegs, bows, handles of knives, and other instruments. The seeds are poisonous.

Lab'yrinth. A building or ground space full of winding passages, which are very difficult to traverse. There were three famous ones in ancient history. One at Arsinoë in Egypt had 3,000, apartments, half of them underground. There was a similar one in Lemnos, and a smaller but famous one in Crete—though this is traditional and its existence doubtful.

Lac. A resinous substance found on certain trees in different parts of the East Indies. It is produced by punctures made by a very small insect called *Coccus lacca*. These insects live on the sap of the trees, and soon become fixed to the branches by the juices which ooze out. The twigs containing the deposit are broken off, and form the *stick-lac* of commerce. *Seed-lac* is the deposit broken off from the twigs, while *shell-lac* is obtained by placing the twigs in hot water, which melts off the gum. It is then purified by straining through cotton bags, and dried on strips of wood. The water in which the lac has been melted is colored red by the bodies of the insects, and after the melted lac is taken out this water is strained and evaporated, and the sediment is cut up into small cakes and sold as *lac-dye*. Lac-dye is largely used in dyeing silk and wool. Shell-lac is used in the manufacture of hats to stiffen the calico frame, and in making sealing-wax and different kinds of varnish—"Lac" is the same as the numeral lakh—a hundred thousand—and is indicative of the countless hosts of the lac insects.

Lace. [Fr., from L. *laqueus*, a noose.] A fabric formed of threads of cotton, wool, flax, silk, silver, or gold, used chiefly for ornamenting dresses. Lace is made either by hand or machine. To that made by the hand the term real lace is sometimes applied, and also pillow or bobbin lace, from being woven upon a pillow or cushion by means of bobbins. Much of the lace now used is made by machinery, the machines at present in use being modifications and improvements on the bobbinet machine invented by Mr. Heathcote of Tiverton in 1809. Nottingham in England, and Alençon, Brussels, Mechlin, and Valenciennes are centres of this industry.

Lac′quer. [From *lac*, a gum or resin.] A varnish composed of shell-lac dissolved in alcohol with gamboge, and used for coating metals, chiefly polished brass, to which it gives a golden bronze color, preserves their lustre, and secures them against rust. The name is also given to a varnish made by the Japanese and Chinese from the juice of the laquer or varnish tree found in these countries. *Lacquer-ware* consist of various articles, such as boxes, trays, cabinets, etc., many of them decorated by inlaying, gilding with gold or silver, designs in color, or carving. The Japanese and Chinese excel in this work, and give the articles a beautiful finish.

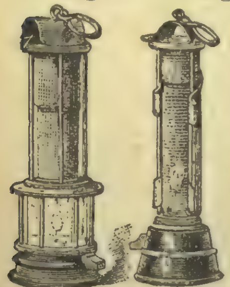


LACE.

Lacrosse′. [Fr. *la crosse*, the hooked stick.] A game of ball, first played by the North American Indians, now common in Canada.

Lady-bird. (*Coccinella.*) A small kind of beetle of a brilliant red, orange, or yellow color, with black spots, or sometimes black with white, yellow, or red spots. It lays its eggs in little collections under the leaves of plants, among the plant-lice, on which both the larvæ and the full-grown insects feed.

Lamp. [Gk. *lampas.*] A vessel used for giving light by means of a wick dipped in oil and lighted. In ancient times lamps were simply flat vessels made of earthenware or stone. Specimens of these have been found in the ruins of Pompeii and Herculaneum. In later times they appear to have been formed from various metals, more particularly bronze. Lamps are now made to give an excellent light, and are also used for heating and cooking. Rushes, animal fats, and fish oils were first used for burning in lamps. These were followed by vegetable oils, which in turn have been largely superseded by mineral oils, such as paraffin, petroleum, kerosene, crystal and mineral sperm. The *safety-lamp* invented by Sir Humphrey Davy in 1815 is of great use in mining. It is covered with wire gauze, and gives the miner sufficient light without the danger of setting fire to inflammable gases. *Arc lamps* and *incandescent lamps* are devices for producing light by electricity.



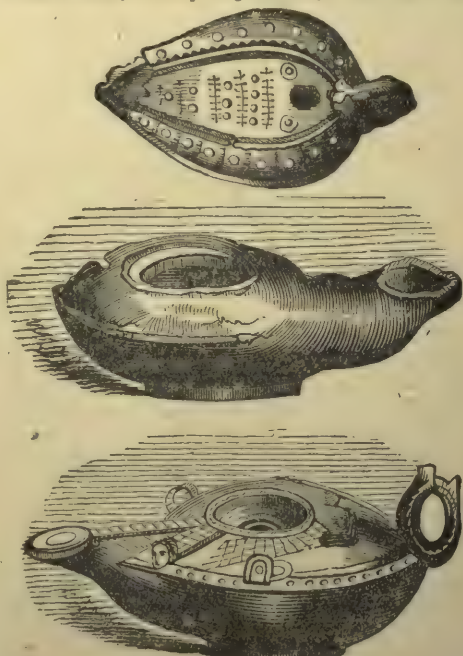
CLANNY LAMP. DAVY LAMP.

Lamp′black. A fine soot formed by burning resin, petroleum, pitch, tar, and oils and fats in close iron vessels. During combustion the dense smoke passes into a chamber covered with a coarse woolen cloth, and a thick coating of lampblack is soon formed, which is shaken off and put up in barrels for sale. Lampblack is used by artists and painters, and is the chief ingredient in China ink and printing ink.

Lam′prey or **Rock-sucker.** A species of fish somewhat resembling the eel in form. Its body is destitute of the paired fins found in most other fishes, is without scales, and covered with a glutinous mucus. The mouth is circular in form, and by it and the tongue, which acts like a piston, the animal attaches itself firmly to fixed objects. Formerly the lamprey was highly esteemed as an article of food, and even of luxury, but is not so commonly used now.

Lance. [L. *lancea.*] A weapon much used by the ancients, consisting of a long shaft with a sharp point. It was an important weapon of war in the Middle Ages, and though now differing in form is still used by European cavalry. Lances are now made of ash or beech wood, about 12 feet long, with a steel point 8 or 10 inches long. Near the point is a small flag, intended to frighten the horses of the enemy. When not in use the lance is carried in a leathern shoe by the right stirrup, a leathern thong on the right arm keeping it in position. In use it is carried under the right arm.

Lancewood. The wood of a tree found in the West Indies, chiefly in Jamaica, of which it is a native, and possessing great toughness and elasticity. It is used by coach-builders for shafts and carriage poles.



ANCIENT LAMPS.

Land-crab. Land-dwelling crabs, of which there are many species. The Black or Mountain Crab of the West Indies lives from one to three miles from the sea, to which it travels, in immense numbers, in April or May, for the purpose of laying its eggs. It is chiefly active at night.

Lapis Laz′uli. [L., azure stone.] The name of a mineral of a rich blue color, consisting chiefly of silica and alumina, with sulphates of soda, and iron in spots or veins. It is found in Persia, China, Chili, and Siberia, and is used for ornamental purposes, especially for inlaid work. In the marble palace built by the Empress Catherine at St. Petersburg there are entire apartments inlaid with lapis lazuli. It was much esteemed by the ancients, who used it for engraving and for vases.

Lap′wing. A bird of the Plover family, with long, broad wings, which from their regular, slow flapping have gained for it the title Lapwing. It is also known by the name *Peewit*, from its peculiar cry. Lapwings are common in Britain all the year, and are also widely distributed in Europe and Asia. They frequent marshy pastures, feed on worms, slugs, and insects, and are hunted for their flesh. Their eggs, which are known as plovers' eggs, are highly esteemed, and fetch good prices in the British markets.

Larch. [L. *larix*.] A cone-bearing tree, common in Europe, Asia, and North America. The European larch attains a height of from 60 to 100 feet, with a trunk of from 3 to 4 feet in diameter. The larch grows rapidly, and is considered to be fit for every useful purpose in forty years' growth. The wood is compact and strong, of a reddish or brown tinge, and is used for railway sleepers, hop-poles, scaffold-poles, and for ship-building. The bark is used for tanning leather. The American larch, or hackmatack, or tamarack, as it is sometimes called, is a slender tree, but its wood is heavy and cross-grained, and highly valued for ship-building and for railway ties.

Lard. [Fr. *lard*.] The fat of the hog after being separated from the flesh and melted. It is largely used for culinary purposes. Lard consists chiefly of stearin, which is a solid and olein, which is a liquid fat. The former is used in candlemaking, and the latter as a valuable lubricant for machinery.


THE LARK.

Lark. [AS. *laferc* or *laverock*.] A well-known bird of the family *Alauda*. The best-known species is the skylark, a familiar songster, remarkable as one of the very few birds which sing freely while on the wing. It begins to sing when it rises from the ground, and though its notes are feeble and interrupted at first, they swell out to their full tone as the songster ascends, and may be heard long after the bird has passed from the range of vision. The larks may be considered as especially birds of the fields and meadows, the nest being made of dry grass, in a hollow in the ground.

Lar′ynx. [Gk. *larynx*.] The upper part of the windpipe or trachea forming the organ of voice. It is situated between the windpipe and the base of the tongue, at the upper and front part of the neck, and opens above into the throat (*q. v.*), and below into the windpipe. The skeleton of the larynx is composed of five principal cartilages, and these are connected by ligaments known as vocal cords, the movements of the organ being regulated by two sets of muscles.

Las′so. [Span. *lazo*.] A rope or long thong of leather with a running noose, used for catching horses, cattle, etc.

Lathe. A machine by which wood, ivory, metals, and other materials are turned and cut as they revolve by a tool held in the hand or fixed in a slide-rest. All the rounded parts of furniture, such as legs of tables, chairs, and stools, the balusters of staircases, tool handles, round rulers, etc., are made on the lathe. Billiard balls and chess-men, and all the round parts of engines and other machines, are made on various kinds of lathes. Articles of irregular form, such as the stocks of guns and pistols, and hollow things, such as wooden bowls and dishes, bread platters and boxes, are also made on the turning-lathe.

Laths. The name given to thin, narrow strips of wood, rarely longer than four feet, used for nailing to the uprights of partition walls, and to the rafters of ceilings. They are placed slightly apart to receive the plaster, which, by being pressed into the spaces, is held firmly when it dries. Laths are now mostly sawn by machinery from Baltic fir or Canadian deal.

Lat′itude. Distance from the equator north or south towards the poles. Lines of latitude are imaginary lines which surround the earth, parallel to the equator, diminishing in length until they reach the poles, where they vanish.

Lat′tice. [Fr. *lattis*, lath-work.] Any work made by crossing laths, rods, or bars of wood or iron, and forming open squares like network; a window made in this way.

Lau′rel. [L. *laurus*.] The name given to a genus of plants, consisting of trees and shrubs, whose leaves and fruit are bitter, astringent, and aromatic, and were formerly much used in medicine. Laurel or bay leaves are now used for flavoring in cookery. The laurel or sweet bay is a small evergreen tree, found in the south of Europe and north of Africa. It has beautiful glossy leaves, and bears black berries about the size of wild cherries. This laurel is celebrated by poets, and used to decorate temples and the brows of victors. The victors in the Pythian games were crowned with the laurels of Apollo, and thus the laurel became the symbol of triumph in Greece and then in Rome. The American laurel is found almost all over the United States,

growing chiefly on rocky hillsides. Its wood is hard and fine-grained, and is used by turners for making chisel handles.

La'va. [It. *laua.*] The name given to the melted matter which bursts or is thrown from the mouth of a volcano. It flows like melted glass or iron down the sides of the mountain, but speedily cools and hardens into a porous mass. Ancient lavas form extensive rock strata in some localities, as in the western United States.

Lav'ender. (*Lavandula.*) A delightfully fragrant plant, much used in making perfumes. The leaves and flowers of lavender are said to have been used by the ancients to perfume their baths; hence the name *Lavandula* may be derived from *lavare*, to wash. The common lavender grows wild on stony mountains and hills in the south of Europe, and is largely cultivated in gardens in Surrey in England and near Philadelphia. The flowers of the lavender are often put into wardrobes to keep away moths. *Oil of lavender*, largely used in medicine, is made by distilling the flowers with water; and *Lavender water*, one of the most popular of all perfumes, is obtained by dissolving oil of lavender with smaller quantities of spirit and rose-water.

Lawn Tennis. A favorite ball game, played on a smooth surface divided by a net. The ball is sent by use of a racket, effort being made to return it over the net as often as possible.

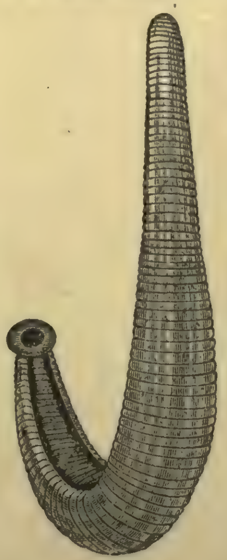
Lead. [AS. *læd.*] A well-known metal of a bluish-white color, very heavy, easily melted and cut, and which may be hammered or rolled out into sheets and drawn into wire. It has been used from very early times, and articles made of it by the ancient Romans—such as water-pipes, water-tanks, weights, rings, etc.—have been found. Lead is soft, highly malleable, and a poor conductor of heat or electricity. It is largely used for water-pipes and cisterns, and for covering the roofs and gutters of houses. Lead is found in a large number of minerals, though often in very small quantities. Most of the lead now in use is obtained from the ore called galena or sulphide of lead. This ore is found in many parts of the world, but the purest veins are got in Great Britain, Germany, Spain, and the United States. The process of smelting the galena ore to get the pure lead differs from that of smelting iron ore, and is done in an entirely different kind of furnace. *Sheet lead* is made by rolling slabs of lead between heavy iron rollers until they are thin. Thick sheets are used for lining tanks and water-cisterns, and for covering roofs, and thin sheets for wrapping up snuff, lining tea-chests, etc. Lead is used in alloy with other metals—forming, when mixed with arsenic, the alloy from which shot is made; with tin, pewter and solder; and with antimony, type-metal. Lead and its compounds are poisonous.

Leaf. A flat, expanded organ of a plant, varying in shape, and situated usually at the extremity of the twigs. It is employed in elaborating the plant food. The crude sap enters the leaf, where it receives carbon from the carbonic acid of the air. This changes the character of the sap and adapts it to serve as plant food.

League. [L. *leuca*, a Gallic mile.] A measure of distance of ancient origin. The Roman league was equal to 1,500 paces, each of 5 feet. The league is used as a nautical measure, and signifies the 1-20th part of a degree—3 geographical miles, or 3.45 English statute miles. The land-league is approximately 3 statute miles. Its length varies in different countries.

Leather. [AS. *lether.*] The hides or skins of animals dressed and prepared for use by tanning and otherwise. The most important leather-making hides are those of oxen, but various kinds of leather are made from buffalo and horse hides, from the skins of sheep, goats, kids, hogs, seals, walruses, rhinoceroses, elephants, antelopes, porpoises, kangaroos, alligators, and certain snakes and sharks. The process of tanning varies according to the materials employed, and the nature and thickness of the hides and skins. In this process tan made from oak or hemlock bark, or other woods containing the astringent substance called *tannin*, is used. The skins, after being cleaned of hair and flesh and otherwise prepared, are soaked in a solution of tan-bark and water, remaining until they are thoroughly impregnated with tannin. This has a preservative action and converts the hides into leather.

Dressed leather. After leather has been tanned, the currier and leather-dresser fit it for the many uses to which dressed leather is applied by a varied series of finishing operations. The surface of the leather is smoothed, and its thickness equalized. It is made soft, flexible, and water-proof; blackened, enamelled, or dyed.



LEECH.

Russia leather is tanned with birch-bark, which gives it a peculiar odor, and prevents moths and other insects from injuring books bound with it.

Morocco leather is so called because it was first brought from Morocco. It was originally made from goat-skins tanned with sumach, but now calf-skins and sheep-skins are used. Morocco leather is now made in France and in the United States, and is largely used for covering chairs and sofas, for lining coaches, for book-binding, and for making pocket-books.

The finest gloves and ladies' shoes are made of kid leather. Sheep-skin is largely used for book-binding, hog-skin for covering saddles, horse-hide for harness, collars, etc., and cow-hide

for boots and shoes. A fine leather is made from seal-skin, and the skins of alligators are sometimes tanned for boots and shoes.

Leech. [AS. *læccan.*] A worm-like animal possessing one or two sucking discs. It is found in fresh and salt water, and sometimes on land. The medicinal leech is from 2 to 3 inches in length, with a minutely-ringed body, composed of 102 skin rings, and has a sucker moved by strong muscles. This species of leech is largely used in abstracting blood from the body for medical purposes.

Leek. [AS. *leac.*] The *Allium porrum*, a plant allied to the onion and used in soup.

Le′gion. The name given to a division of the Roman army, which corresponded to a brigade in modern armies. The legion—3,000 and afterwards 6,000 strong—was divided into centuries or companies of 100 men each. The word as now used indicates a great number.

Lem′ming. A small animal of the rat family, found in Scandinavia and Finland. It is a vegetable feeder, and is remarkable for its occasional migrations, in which bands of immense multitudes pass from the mountains to the sea. Great numbers are destroyed by carnivorous birds and animals and thousands are drowned, few living to return.

Lem′on. The name of a tree (*Citrus limonum*) and its fruit; a native of Southern Asia, but now cultivated in the south of Europe, especially in Sicily, in the West Indies, and in California and Florida. It forms a straggling bush, and is more delicate than the orange. There are many varieties of the lemon, but the most common are the common or Genoa lemon, the thin-skinned lemon, the sweet lemon, and the citron lemon. The chief products of the lemon are the juice and the oil. The juice has a peculiar and agreeable flavor, due to citric acid, and is much used in the well-known refreshing drink called lemonade. It is also very useful in the prevention and cure of scurvy. The rind of the lemon is used by cooks and confectioners for flavoring. The oil of lemons is extracted from the outside part of the peel either by pressure or by distillation, and is much used in medicine and in perfumery.

Le′mur. A family of arboreal animals bearing some resemblance to the monkeys in their mode of progression and their opposable thumbs and great toes. They are much less active and intelligent than the monkeys. They are chiefly natives of Madagascar.

Lens. [L. *lens*, a lentil seed, which is much like the shape of a convex lens.] A piece of glass or other transparent substance, which may be spherical on both sides, or one side may be spherical and the other a plane surface. There are many forms of lenses, their purpose being to refract the rays of light, causing them to converge to a point, to diverge, etc. Lenses are usually made of flat pieces of glass, and the greatest care is needed in grinding and polishing them, as the least unevenness in the surface would spoil them. They have many uses, but the most common is that of making eye-glasses and spectacles—convex lenses being used for far-sighted and concave lenses for near-sighted persons. Lenses of various kinds are used in making opera-glasses, microscopes, stereoscopes, telescopes, and other instruments.

Lent′il. [Fr. *lentille.*] An annual plant not unlike the bean, a native of the countries bordering on the Mediterranean, and cultivated from the earliest times. It is now grown in many parts of Europe and Asia, the straw being used as fodder for sheep and cattle. The flour of lentils is made into lentil soup, which is considered highly nutritious.

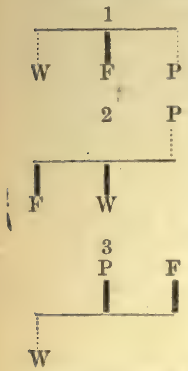
Leop′ard. [L. *leo*, and *pardus.*] A rapacious quadruped of the genus *Felis* or Cat group, found chiefly in Africa, though not uncommon in some parts of Asia. In general appearance it resembles the tiger, though not nearly so large. Its head, neck, back, and limbs are covered with black spots on a fur of a yellow color, whilst its sides are marked by at least ten ranges of black spots of a larger size. The leopard is very active, and can leap with the greatest ease, or ascend trees in pursuit of prey. It lives chiefly in thick forests, and its prey consists of deer, antelope, monkeys, and smaller animals, but it will sometimes visit farms and villages and feed on pigs, poultry, goats, sheep, or dogs. The leopard seems to dread and flee from man, and will only attack him when closely pursued or brought to bay. Leopards are captured by means of pitfalls covered with branches of trees, on which pieces of meat are placed as bait. They are chiefly valued for their skins.

Lep′rosy. A so far incurable skin disease, in which scaly patches, circular in form, appear on the skin and gradually spread. Its progress is very slow and those attacked by it may live for years. It is contagious and was very serious in ancient times and in the Middle Ages, the only treatment being to keep the lepers separate. It is now rarely seen in civilized countries. Of recent years it has been severe in the Hawaiian Islands, where the lepers are all sent to a settlement on the island of Molokai.

Let′tuce. [Fr. from L. *lactuca*, which is from *lac*, milk, the plant having a milky juice.] An annual plant, supposed to be a native of the East Indies; cultivated from remote antiquity, and now grown all over the world where the climate admits of it. The two principal kinds are the coss lettuce, with oblong upright leaves, and the cabbage lettuce, with rounded leaves and a head like a cabbage; and of these two kinds there are many varieties. The leaves of lettuce are used as a salad, and though they do not contain much nourishment, they are easily digested and gently laxative. Lettuce-opium is made from the juice of the plant, and is used medicinally to allay pain and induce sleep.

Lev′el. An instrument by which to find or draw a horizontal line in setting buildings. The *spirit-level* has a bubble of air on the surface of spirits of wine enclosed in a glass tube. In water-levels water is used instead of mercury or spirits of wine.

Le′ver. [Fr. *levier.*] One of the mechanical powers. It consists of a bar of wood or metal, supported by and movable at some point of its length round a prop, called the *fulcrum*, while at the other points are placed the *weight* or resistance to be overcome and the *power* or force which overcomes it. Levers are divided into three kinds, namely—(1) when the fulcrum is between the weight and the power, as in the crowbar; (2) when the weight is between the power and the fulcrum, as in rowing a boat; (3) when the power is between the weight and the fulcrum, as in raising a ladder from the ground. Bones of animals are levers of the third kind.



Ley′den-jar. [Invented in Leyden, Holland.] An instrument used to accumulate electricity. It is made of glass, covered on both sides with tin-foil nearly to the top, and for the purpose of charging it a brass knob is fixed to the neck of the jar, through which the electricity passes to the interior tin foil. (See *Electricity.*)

Li′chens. [Gk. *leichen.*] These are flowerless plants, without separate stems or leaves, found on rocks, trunks and branches of trees, walls and fences, and on barren soil. They are common everywhere and at all levels, many of them growing on mountain sides to the verge of perpetual snow. Lichens have no roots, but grow by receiving moisture through all parts of their surface. They contain a kind of starch, a bitter substance, a resin, and various coloring matters. They yield rich dyes of various colors, some of which are used in dyeing silks. Iceland moss is a lichen which grows in the most barren parts of Iceland and other cold countries, and is used for food and medicine. The reindeer lichen, covering the barren plains of Lapland and Siberia, is the chief food of the reindeers; and at one time, when grain was very scarce in Sweden, this lichen was ground up with flour to make bread. The *tripe de roche* is a lichen growing in the northernmost parts of North America, which the inhabitants there eat mixed with the roe of fishes. (See *Moss.*)

Life′boat. A boat constructed for saving persons in cases of shipwreck. Its chief qualities are strength, to resist the violence of waves, a rocky beach, or collision with the wreck; buoyancy, to avoid foundering when a sea is shipped; ability to right itself when capsized, facility in turning, and provision for speedy launching.

Light. [AS. *leoht*, *liht.*] The agent which produces vision and thereby enables us to see objects. Light comes to us from self-luminous bodies in the heavens—such as the sun, the fixed stars, nebulæ, and some meteors; and from substances on the earth—such as the electric light, burning gas and oil, etc. Light proceeds from all luminous bodies in straight lines, each one of which is called a ray of light. It is supposed to consist of undulations or waves in a rare substance called the luminiferous ether. It moves at the rate of over 186,000 miles per second, or more than a million times faster than sound, and it takes eight minutes for the light of the sun to reach the earth. When light falls upon the surface of a body, part of it is *reflected*, the rest enters the body. Thus, when we look at a house, the light goes first from the sun to the house, and then glances from it into our eyes, and thus we are able to see a thing which does not make any light itself. When a slanting ray of light passes from air into water, glass, or anything through which it can shine, the ray in the water, glass, etc., though still a straight line, is not a continuation of its old path, but is bent as it passes from one medium to the other. This bending of the ray is called *refraction.* (See *Prism.*)

Light′er. A large, open, flat-bottomed boat used in loading and unloading ships.

Light′house. A tower or building erected on headlands along the coast, and on rocks in the sea and in rivers, and at the entrance to harbors, from which a light is shown at night to guide mariners in navigating ships, and to warn them of hidden reefs or dangerous shores. *Lights* are fixed, revolving, flashing, colored, and intermittent. There are 530 lights round the British coasts, and they are so placed that at any point a ship is always in sight of a light. About 2,000 lights are on the United States coasts.

Light′ning. The vivid flash of light which accompanies a sudden discharge of atmospheric electricity. It occurs in three distinct forms—namely, forked lightning, sheet lightning, and ball-lightning. In forked lightning the path taken by the electricity is that which gives the least resistance, and is distinctly seen to be made up of straight lines and sudden bends. Sheet-lightning appears as a diffused glare of reddish color, spread over a considerable extent of the sky, and is sometimes called summer lightning, as it is of frequent occurrence in warm weather. Ball-lightning is a very destructive and dangerous form of lightning, but happily of rare occurrence.

Lig′num-vitæ. [L. *lignum*, wood; and *vitæ*, of life.] The name of the wood of the guaiacum tree, which grows in the West Indies and South America. The wood is very heavy, hard, close-grained, and tough, and is used for making pulleys, wheels in ships' blocks, pestles, rulers, and other articles which require to be of a tough material. The resinous juice of the tree is used in medicine in cases of rheumatism and skin diseases.

Lil′ac. [Sp. *lilac.*] A beautiful and fragrant flowering shrub, a native of Persia, brought to Vienna about three hundred years ago, and now cultivated as a familiar garden ornament throughout Europe and North America. The wood is fine-grained, and is used for turning, inlaying, and making small articles. A fragrant oil can be obtained from the leaves by distillation.

Lil′y. (*Lilium.*) The popular name of a family of plants of many species, producing flowers of great beauty and variety of colors. The root is a scaly bulb, the stem herbaceous and simple, sometimes several feet high, and bearing elegantly-formed flowers near the summit. The white lily is a native of the Levant, and is now extensively cultivated in gardens, its large white flowers being as much prized for their fragrance as for their beauty. The orange lily and the martagon or Turk's cap lily are natives of the south of Europe, and now form very showy ornaments of the flower-garden. The tiger lily is a native of China; and among the many species in North America the finest is the *superbum* (L.), which grows in marshes to the height of from 6 to 8 feet, bearing reflexed orange flowers spotted with black.

Lime. [AS. *lim.*] An alkaline earth, found as a carbonate in chalk, marble and limestone. Quick lime is obtained by heating pure carbonate of lime to full redness in lime-kilns, when the carbonic acid is expelled and lime is left. When lime is moistened with water it swells up, gives off much heat and steam, and changes into a soft white powder, commonly called slaked lime (*calcium hydrate*). In this form it is used for purifying coal gas, in making mortar and plaster for building purposes, for removing the hair from skins in tanning, making paper pulp, and as a manure for land. When slaked lime is put in cold water and allowed to settle, the clear water is *lime-water.* In addition to the uses already mentioned, lime is used in the manufacture of washing-soda, bleaching-powder, and ammonia-water; in refining sugar, and also in iron furnaces, lead-smelting, and glass-making. Bleaching-powder, commonly called chloride of lime, is a dry white powder, with a slight acid smell. It is largely used as a disinfectant. Carbonate of lime exists in great abundance in nature, and when crystallized is known as *Iceland spar.*

Lime-light. A light of great brilliancy, also called Drummond light, from its inventor. It consists of a burning jet of oxygen and hydrogen directed upon a cylinder of lime. This becomes white hot and yields an intense white light which has been seen at a distance of 112 miles. It is much used in the magic lantern and the reflecting microscope.

Lim′pet. [L. *lepas.*] A small shell-fish which forms a *vacuum* under its shell, and adheres to rocks, being pressed by the weight of the atmosphere.

Lin′den or **Lime.** A large and beautiful tree, of which the American linden often grows to the height of 80 feet, and to 2 or 3 feet diameter. The leaves are large and serrated. The wood is white and soft, much used for carriage and cabinet work. The inner bark is strong, and ropes are made from it. In Europe the linden is also called the lime tree. The principal street of Berlin is named *Unter den Linden* (Under the Lindens).

Lin′en. [L. *linum*, flax.] A cloth very much used, made of flax, which is woven into such goods as tablecloths, cambric, lawn, shirting, sheeting, towels, etc. Linen is manufactured in the British Islands, and in many manufacturing districts in Europe, particularly in France, Belgium, and Germany. Linen thread is prepared from fine bleached linen yarn.

Ling. A fish resembling the cod in form, but longer and more slender.

Lin′net. [Fr. *linot.*] A well-known song-bird, widely distributed in Europe and in the northwest of Africa. It is barely 6 inches in length, feeds on soft seeds, and forms its nest of soft stems and moss, lined with wool and down, in which it lays from four to six eggs of a bluish-white ground, speckled with reddish-brown, and generally rears two broods in a season.

Lino′leum. A kind of floor-cloth made of ground cork and oxidized linseed-oil spread on jute canvas, with oil-paint coated on the back. It was invented by Walton in 1860.

Lin′seed. [AS. *lin*, flax; and *sæd*, seed.] The seed of flax, largely used for making *linseed-oil* and *oil-cake.* In making oil the seeds are bruised or crushed, then ground and pressed in a hydraulic or screw-press, either cold or heated by steam. The seeds give more oil when heated, but the cold-pressed oil is the best. Linseed-oil is largely used in making paints, varnishes, and printing inks. The remains of the seeds after the oil is pressed out make oil-cake, which is valuable for feeding cattle. Linseed itself is excellent food for cattle and for poultry.

Lint. [AS. *linet.*] Linen cloth or rags scraped so as to form a soft material suitable for dressing wounds and sores.

Li′on. [Fr., from L. *leo.*] The largest representative of the *Felidæ* or Cat family. Its distinctive features are the large size of its head; the great mane, which covers the head, neck, and shoulders of the males; the uniform tawny color of the skin, without spots or stripes; and the tuft at the extremity of the tail. It attains its full growth when about seven or eight years old, and a male lion of the largest size will then measure about 8 feet, and the tail about 4 feet. The lioness is smaller, and has no mane. Lions are found in the tropical regions of Africa and Asia. Their lurking place is near a spring or by the side of a river, where, concealed among the brushwood, they wait for the animals coming to drink. They hide away in the daytime, and prowl about in the evening and early morning, and sometimes all night long, their eyes being better adapted for the night and twilight than for the day. They feed on antelopes, zebras, giraffes, and wild cattle, and sometimes carry off horses, sheep, and other domestic animals.

Liq′uid. [L. *liquidus.*] A fluid or flowing substance, distinguished from a solid by yielding laterally to pressure. It always returns to the same level.

Liquid Air. Air reduced by great pressure and intense cold to the liquid state. This process, of recent discovery, can now be performed with ease and rapidity, large quantities being produced at a low cost. Efforts are being made to use it as a

source of power. Air can also be frozen into the solid state, and every known gas, even the volatile hydrogen, can be liquified.

Liq'uorice. The word liquorice means "sweet root." The liquorice plant has stems 3 to 4 feet high, with small blue, violet, or white flowers, and the roots are sometimes half an inch thick and a yard long. It is cultivated in the south of Europe, chiefly in Spain and Italy. The roots are much used by porter-brewers. Spanish liquorice or liquorice juice is largely imported from the south of Europe in rolls or *sticks*, packed in bay leaves, or in the form of an extract run into boxes of about 2 cwt. each.

Lithog'raphy. [Gk. *lithos*, a stone; and *graphein*, to write.] The art of tracing letters, figures, and other designs on stone, and of transferring them to paper by impression. It was invented in 1796 by Alois Senefelder in Bavaria, where the most suitable stones are still quarried. The stone is a kind of limestone, composed of lime, clay, and silica, usually of a gray color and of a very fine grain. The stones are found in layers varying in thickness, the thickness required for printing-stones being from 1½ to 5 inches, according to size. They are ground face to face with sand and water, until the surface of both stones is perfectly level. After being carefully polished with a smooth polishing-stone they are ready for use. Writings or drawings may be made on the stone with a fine pen or brush, or drawn on paper having a specially prepared surface, and then transferred to the stone. The methods of printing, consisting of etching out the spaces between the lines of drawing with an acid, inking, etc., are too complicated to be here described. Chromo-lithographs are lithographs in which many colors are printed in one picture. As each color is printed from a separate stone, from three to thirty stones are often used to produce colored pictures.

Liv'er. [AS. *lifer*.] In man the largest gland in the body, situated in the right upper side and towards the front of the abdominal cavity, measuring about 12 inches from side to side, and weighing from 50 to 60 oz. The blood, laden with nutritious matter, has to pass through the liver before it can get into the general circulation; and the chief function of the liver is to secrete or gather the bile from the blood and send it into the gall-bladder, where it is stored up ready to be discharged into the intestines during digestion.

Liz'ard. [Fr., from L. *lacerta*, a lizard.] A term applied to an order of reptiles found in almost all countries, but most plentiful in warm climates. They include the gecko, monitor, dragon, frilled lizard, chameleon, and many others. The body is usually well covered with scales, and is supported usually on four legs. Lizards vary in length from a few inches to several feet. In a great many lizards the tail is almost as brittle as glass. A glove or handkerchief thrown upon one is enough to break it off, but a new one will soon grow out. Their food consists of insects, worms, and small animals; but some prey upon larger animals, and others are herbivorous.

Lla'ma. A most useful South American animal, somewhat like a camel, but smaller and without a hump. The llama lives in flocks among the Andes, and feeds mostly on coarse grasses, mosses, lichens, and shrubs. The ancient Peruvians tamed the llama, and kept great numbers of them for beasts of burden; and it is still put to this use in many parts of South America, especially for carrying goods across steep mountain roads where horses cannot go. The hair of the llama is woven into stuffs similar to alpaca.

Load'stone or **Magnetic Iron Ore.** A hard reddish-black or grey mineral, found in various countries. (See *Magnet*.)

Lob'ster. A well-known crustacean, much esteemed for food. Lobsters are found all round the coasts of Europe, and along the Atlantic coast of the United States north of New York. Immense quantities are sent from America to Europe, packed and preserved in hermetically sealed cans. Lobsters differ in size, weighing from 2 to 15 lbs. Their two large claws are fitted with tooth-like serrations—in the one they are many and sharp, in the other few and blunt—and with these they crush their food, which is chiefly clams, mussels, and other molluscs. They are caught in traps made either of basket-work or of netting, the bait used being dead fish. The shell of the lobster is dark-green when alive, but it turns to bright red when boiled.

Lock. [AS. *loc* or *loce*.] A well-known instrument for fastening doors, drawers, chests, etc., generally opened by a key. The chief parts of a lock are the bolt or part which locks, and the staple into which the bolt enters when turned by the key. Good locks are distinguished by the number of impediments that can be interposed betwixt the key and the bolt, these impediments being called the *wards* of the lock, which are so arranged as to slip into corresponding grooves of the key. The *tumbler-lock* has two notches on the upper side of the bolt, on which rests the tumbler, which is pressed by a spring into the notches according as the lock is open or shut.

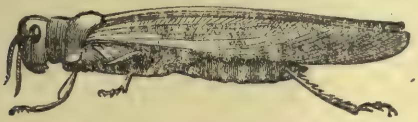
Locomo'tive Steam-engine. The traction engine

used on railroads for drawing cars. The first effective locomotive, the "Rocket," was invented by George Stephenson in 1829, though others

had been made earlier. Since then immense improvements have been made and very swift and powerful locomotives built.

Locomobile′. An automobile or motor carriage moved by steam.

Lo′cust. [L. *locusta.*] An insect somewhat like a grasshopper in shape, but with shorter antennæ or feelers and stouter legs. Its hind legs are very strong, enabling it to make long leaps; and its wings are beautifully colored, and from their great length give it the power of sustaining long and high occasional flights. "Locusts fly in great clouds from place to place, and eat up every



green thing where they alight." In some parts of Asia and Africa they come in such numbers as to darken the sky in their flight, and they are frequently seen in southern Europe and commit great ravages there. They have also been very destructive in the western United States, where they are known as the Rocky Mountain locusts. The *seventeen-year locusts* live as larvæ in the ground for seventeen years, and afterwards come to the surface and become winged insects. Some species remain underground for a shorter period.

Locust or St. John's Bread. A tree highly valued for its wood. Its leaves are soft and velvety, and it bears clusters of white, sweet-smelling flowers. Its wood is compact and hard, of a greenish-yellow color. The honey-locust tree of America and the West Indies is a large tree, but its wood is not so valuable as that of the common locust. It bears long flat pods full of brown seeds, in a honey-like pulp. Its trunk and limbs are covered with sharp thorns.

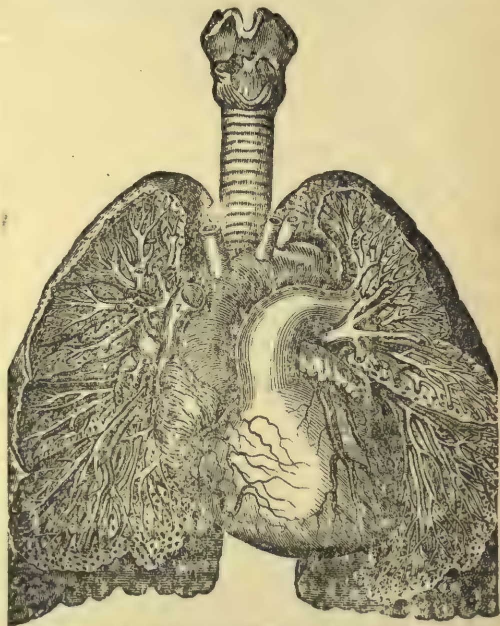
Log. A part of the apparatus for measuring the rate of a ship's motion through the water, consisting of a flat piece of wood, usually in the form of a quadrant, loaded with lead at its circular edge to make it float upright. To it is attached the log-line, which runs freely from a reel, and is marked by *knots* at intervals of five fathoms. The number of *knots* run out during the running of the half-minute sand-glass tells the number of miles per hour which the vessel is making. (See *Knot.*)

Log′wood. [So called because it was brought to Europe in logs.] A tree which grows in Central America, on the Bay of Campeachy, and some of the West India islands. The wood, sometimes called *Campeachy wood*, is of a deep red color internally, and is very extensively used as a dyewood. Logwood is sometimes used as a medicine.

Lon′gitude. The lines of longitude are a series of imaginary lines which surround the earth at right angles to the equator and pass through the poles. Longitude is measured along the equator east or west from a standard line or meridian, that of Greenwich, England, being usually employed. The length of a degree of longitude decreases north and south from the equator, and vanishes at the poles, where the lines all meet.

Lum′bering. The cutting of forest timber for commercial use. This has become an immense industry in the United States, more than 24,000,000,000 feet being cut annually for various purposes. The white pine has long been the favorite lumber tree, but many others are used.

Lungs. [AS. *lungen.*] The lungs are the organs of respiration. In man the lungs lie in the thorax or chest on each side of the heart--the right lung being a little shorter and broader than the left lung. They are light, spongy bodies, full of little cells which can be filled with air. The blood sent from the right side of the heart to the lungs is of a dark color, and contains much carbonic acid gas; while the blood taken away from the lungs back to the left side of the heart is of a scarlet hue, and contains less carbonic acid gas and more oxygen. The oxygen



THE LUNGS, WIND PIPE AND HEART

is taken from the air that enters the lungs, while a nearly equal quantity of carbonic acid gas passes from the blood outwards into the air, and is expelled from the mouth. (See *Heart.*)

Lute. An ancient musical instrument, of the guitar kind. It somewhat resembles the pear in shape, and was played by striking the strings with the fingers. It was in common use till the end of the 17th century, when the guitar took its place.

Lynx. [L. *lynx.*] An animal resembling the common cat, but with longer ears and a shorter tail. It preys on small quadrupeds and birds, and in pursuit of prey frequently climbs to

the tops of tall trees. Lynxes are widely distributed throughout Europe, Asia, and North America. The Canada lynx is hunted for its fur, which is prized for robes, muffs, and collars.

Lyre. The oldest known of all stringed instruments, invented, according to old tradition, by the god Mercury. It was the predecessor of the harp, and possessed at first but three strings, which were gradually increased to eleven. It was played upon by a stick of ivory or polished wood. It was used to accompany the voice and was probably of Egyptian origin.

M

Macad'am. Broken stones, about from 2 oz. to 6 oz. in weight each, used as road metal; invented about 1810 by Macadam, a Scottish road contractor.

Macaro'ni. [Ital. *maccheroni*, from *maccare*, to bruise or crush.] A kind of food made from the paste or dough of fine wheat flour, formed in small tubes or pipes. It forms a favorite article of food among Italians. In the neighborhood of Naples whole villages are engaged in its manufacture. It is also made at Marseilles and other places in the south of France, and large quantities are exported to all parts of the world. Macaroni is used in various ways—boiled, served with grated cheese, for thickening soups and for making puddings.

Macaroon'. A favorite cake or biscuit, composed chiefly of the meal of sweet almonds, whites of eggs, and sugar.

Macaw'. A race of beautiful birds found in the tropical regions of America, and included in the Parrot family.

Mace. A staff with an ornamental head, carried before officers of state and magistrates as an emblem of authority; a well-known spice, which forms the inner envelope of the growing nutmeg. It occurs as a fine scarlet net-work, which is stripped off and dried. It is regarded as the most choice of all the spices.

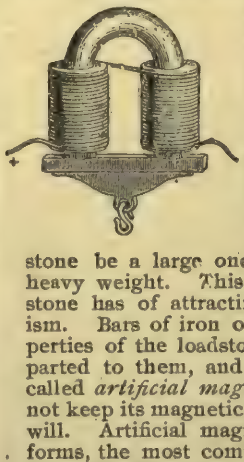
Mack'erel. [Fr., from L. *macula*, a spot.] A well-known salt-water fish, marked with spots on its sides, and much used for food. They move about in vast shoals, and visit the British and American coasts in summer, following after herrings, sprats, or pilchards, on which they prey. They are caught by means of drift nets and shore weirs, but a common mode of capture is by hook and line. The hooks are baited with small pieces of mackerel skin; but the mackerel is a very voracious fish, and will bite at a piece of red flannel, or anything brightly colored or of a glittering appearance. The common mackerel averages 14 inches in length, and weighs about 2 lbs.

Mad'der. [AS. *mæddere*.] The name of a very useful red dye obtained from the roots of the madder plant, which is found in the warm parts of the Old and New Worlds. Madder is used by dyers to make a great variety of red tints, and by varying the mordant such colors as madder-orange, madder-purple, madder-yellow, etc., are easily produced. Turkey-red used in dyeing cotton goods is a madder color. Alizarin, the red coloring principle of madder, is now made artificially.

Mag'ic-Lan'tern. An optical instrument which, by means of lenses and a lamp or lime-light, enlarges small figures painted with transparent varnish on sides of glass, and exhibits them on a white screen in a darkened room. It is said to have been invented by Athanasius Kircher in 1646. At present transparent photograph slides, plain or colored, are used in the lantern, and much used in illustrating lectures.

Magne'sium. A metal of a silver-white color, found in many minerals. It is got by fusion from magnesium chloride. It is very light, easily tarnished, and when lighted burns with a brilliant glow. It may be drawn into wire, filed, bored, or flattened easily. On burning, magnesium unites with oxygen, and leaves a white powder. This is called magnesia (*magnesium oxide*), which, when united with sulphuric acid, makes magnesium sulphate. Magnesium sulphate is found in a mineral spring at Epsom in England, and is commonly known as Epsom salts.

Mag'net. [L. *magnes*, from *Magnesia*.] An ore of iron, "the loadstone," first found at Magnesia, a city in Lydia; now found in different parts of the world, especially in Sweden and in the States of New York and New Jersey. A load-stone or natural magnet has the peculiar properties of attracting iron and some of its ores, and of pointing to the poles. If a loadstone be held near to iron filings, they will cling to it in a cluster. Tacks and small nails may be raised by it, and if the loadstone be a large one it will hold up quite a heavy weight. This power which the loadstone has of attracting iron is called magnetism. Bars of iron or steel may have the properties of the loadstone or natural magnet imparted to them, and hence we have what are called *artificial magnets*. Common iron will not keep its magnetic properties long, but steel will. Artificial magnets are made of various forms, the most common being the bar shape. Powerful permanent magnets are made by placing several thin magnetized bars side by side, fastened firmly together. Such a collection of magnets is called a *magnetic battery*, and is more powerful than a solid bar of the same weight. A bar of soft iron may have the properties of a magnet imparted to it by sending a current of electricity through a coil of wire surrounding it. It is then called an *electro-magnet* (See *Dynamo*.)



Magno'lia. [*Magnol*, a professor of botany at Montpelier, died 1715.] The name of a tree, a native of North America, India, China, and

Japan, now very widely cultivated, and much admired on account of the beauty of its flowers and foliage.

Mag′pie. [*Mag*, short form of Margaret; and *pie*, from L. *pica*, a magpie.] A bird of the Crow tribe, distinguished from the true crows by its small size, short wings, long tail, and variegated plumage. It is noted for its cunning, is easily tamed, and may be taught to speak a few words. It feeds on snails, slugs, worms, frogs, rats, mice, and the eggs and young of poultry; and when disturbed by any person or animal it keeps up a continual chatter, from which comes the saying to "chatter like a magpie." Magpies are common in Europe and in the northern parts of America.

Mahog′any. The wood of a tree of the same name, a native of Central America and the West Indies. It is a beautiful tree, from 80 to 100 feet high, the trunk being often 5 feet in circumference. The wood is heavy, hard, close-grained, of a reddish-brown color, and susceptible of a brilliant polish. It is used in the making of furniture, and for the inside woodwork of railway cars, sometime solid, but more often as a veneer, or thin layer glued on inferior wood. The wood varies much in value according to the color and beauty of its veins.

Maid′enhair. A species of fern, so called because of its very fine hair-like fronds.

Maize or **Indian Corn.** An important grain of American origin, distinguished by the peculiar arrangement of its large seeds on a long cylindrical cob. It grows on a stalk resembling that of the sugar cane, varying from 5 to 10 feet in height. Its cultivation is simple, and the returns very large, its produce being greater than that of any other grain. Corn-flour is extensively used as food. Maize meal is not well adapted for making bread, but is sometimes mixed with wheaten flour for that purpose. It is also used in the manufacture of starch. In some countries the husks are used in making paper and mattresses, and in stuffing chairs and saddles. More than 2,000 million bushels of maize are grown in the United States annually, much of it being used in fattening swine.

WINE SKIN BOTTLES.

Mal′achite. A mineral of a dark and emerald-green color; a carbonate of copper, much used for ornamental purposes.

Mala′ria. [Ital. *mala*, bad; and *aria*, air.] A poisonous condition of the air most powerful near marshes, producing certain kinds of low fever. It is found to be due to a bacterial microbe, probably largely disseminated by mosquitoes.

Mal′let. [Fr. *maillet*.] A wooden hammer for beating lead, etc., for driving wooden pins, or for using with chisels.

Mal′low. A plant common throughout Europe and in Britain, on waysides and heaps of rubbish. Its soft downy leaves are sometimes used to allay external inflammation.

Malm′sey. [From *Malvasia*, in the south of Greece.] The name of a sweet wine, or the grape from which it is made; originally exported from Malvasia, but now made in other places.

Malt. [AS. *mealt*.] Barley or other grain steeped in water until it begins to germinate, and then dried to stop the growth, thus converting the starch of the grain into sugar. It is used in brewing and distilling.

Mam′mals. [L. *mamma*.] The highest class of vertebrate or backboned animals; so called because they all feed their young with milk formed in their own bodies. In mammals the heart is divided into four chambers, the blood is warm, and the skin has a covering of hair, wool, or bristles.

Man. [AS. *man*.] Man is the chief of mammals, the superior of all animals, the only one which walks erect, and the only one which talks. He excels all other animals not only in body, but in mind. This enables him to reason and to invent, and to have power over the elements and lower animals. The mind is seated in the brain, and man has a much larger brain, in proportion to the size of his body, than any other animal. The human body is made up of the head, trunk, arms and legs. The head contains the brain and the organs of hearing, seeing, smelling and tasting. The trunk is divided into two parts by a partition called the diaphragm. The upper part, called the thorax or chest, contains the heart and lungs; and the lower part, larger than the upper, called the abdomen or belly, contains the stomach, intestines or bowels, liver, and kidneys. The arms and legs are made up of a framework of bones joined together by ligaments.

Man′akin. The name applied to a race of birds common in the tropical parts of South America, of very small size, and noted for the beauty of their plumage.

Manchineel′. [L. *mancanilla*.] A tree which grows in the West Indies and tropical America, noted for its poisonous fruit and poisonous milky juice. The Indians use it for poisoning their arrows. The wood is of fine quality, beautifully veined, and highly valued for cabinet-work.

Man′atee. A genus of marine, plant-eating mammals, known as cow-whales or sea-cows, found in the coast waters and river mouths of Africa and South America. They include the Manatee and the Dugong.

Manganese′. A metal closely allied to iron. The important manganese ores are black oxide, brown oxide, and bog manganese. Large deposits exist in Spain, Portugal, and the United States. In Nova Scotia there is an ore very free from iron much used in glass-making. Manganese is largely used in the Bessemer process and as spiegel iron.

Man′go. [Malay.] The fruit of the mango-tree, which grows in India and the East and West

Indies. It is very nutritious, and is used as a dessert in hot countries. The green fruit is pickled in the East Indies.

Man′gold or **Man′gel-wurzel.** [Ger. *mangold*, beet; and *wurzel*, root.] A plant resembling beet, but larger and coarser, extensively cultivated as food for cattle.

Man′grove. [Malay.] This tree grows on muddy shores and river-banks in tropical countries. It sends down shoots from its branches, which take root and form new stems.

Manil′a-hemp. [From *Manila*, in the Philippine Islands.] The material obtained from the thread-like fibres of a kind of banana-tree which grows in the Philippine Islands, and largely used for making cables, ropes, and cordage.

Manioc or **Mandioc.** (See *Tapioca*.)

Map. [Fr., from L. *mappa*, a napkin.] A drawing or representation on paper or other material of the surface of the earth or part of it, showing the shape and position of the countries, seas, rivers, etc.

Ma′ple. [AS.] A tree with a great variety of species, many of them found in North America, some in Europe and Asia, and a few in Japan. Some are small shrubs and others are large trees. The red maple, the sugar maple, and the white maple are common throughout the United States. The wood of the red maple is used for inlaying and for making stocks of rifles and fowling-pieces. The sugar maple yields a sap from which sugar is made, and the wood forms excellent fuel, and makes the best of charcoal. Some kinds, called curled and bird's-eye maple, because the grain is twisted or marked like birds' eyes, are used in cabinet-work. The wood of the common maple, a native of many parts of Europe and Asia, is fine-grained, compact, takes a high polish, and is much used by turners, and for carved work.

Mar′ble. [Fr., from L. *marmor*.] Certain varieties of limestone, of sufficiently compact texture to admit of a polish, are known by the name of marble. It is a beautiful stone, usually white, but frequently colored, and marked with stripes, spots, and shades of different tints. As a building stone, marble is valuable for its great durability; and being susceptible of a brilliant polish, is largely used for the purposes of art or architectural ornament. Carrara marble, from quarries in North Italy, and Parian marble, from the isle of Paros, are famous for statuary purposes.

Mar′garin. [Fr.] A solid, fatty, pearl-like substance (of stearin and palmitin) made from olive and other vegetable oils, and also from the fat of some animals.

Mar′igold. A well-known annual plant, bearing a large yellow flower, a native of France and the southern parts of Europe. The French marigold and the African marigold, both Mexican species, have brilliant flowers, and form beautiful borders in flower-gardens. The well-known ice-plants are fig-marigolds.

Mar′joram. [Fr.] A genus of plants of the natural order Labiatæ. The most common kind is the sweet marjoram, which diffuses a sweet and pleasant odor, and is much used in cookery for seasoning.

Marl. A mixture of clay and carbonate of lime, found in Europe, and along the Atlantic coast from New Jersey southward. It is used as a fertilizer.

Mar′malade. [Portuguese *marmelada;* from *marmelo*, a quince.] A preserve made by boiling fruits, such as oranges, pine-apples, and quinces. The most common kind of marmalade is made from bitter or Seville oranges. The rind is cut up into thin strips and boiled with the pulp and an equal weight of sugar, to which half that weight of water is added.

Mar′moset. A small kind of monkey, found only in South America.

Mar′mot. An animal nearly allied to the squirrels, but in form and habits more closely resembling rats and mice. Marmots are natives of the higher parts of the Alps and Pyrenees, and of Central Asia and North America.

Mar′row. [AS.] Fatty matter contained in the hollow parts of the large bones of animals. The whale, the skate, and the turtle have no cavities in their bones.

Mars. The smallest of the planets except Mercury, and the nearest to the earth of the outer planets. It is of nearly 5,000 miles diameter, and about 142,000,000 miles from the sun. It is the only planet the details of whose surface can be seen from the earth, and presents interesting appearances not yet understood.

Marsu′pials. An order of mammals distinguished by the fact that the young are born in the embryo state, and are carried for a time in a peculiar pouch in the abdomen of the mother.

Mar′ten. [Fr. *marte*.] A genus of carnivorous quadrupeds, belonging to the Weasel family. The body is elongated and slim, the ears larger than in the weasel, the tail bushy, the legs short, and the feet have five toes, with long sharp claws. Martens live generally in thick woods, and can climb trees with the greatest ease. They feed on rats, mice, birds, and other small animals. They are widely distributed over Europe, Asia, and North America. The sable marten inhabits Siberia, and furnishes the highly valuable sable fur. The pine marten, or American sable, is found in the northern parts of North America, especially in the thick pine woods. It is much hunted for its fur, which is very handsome and highly prized.

Mar′tin. A genus of birds of the Swallow family. The best known of the American species is the purple martin. It will readily nest in a bird-box, near houses.

Mas′sage. A system of medical treatment by kneading, rubbing, and stroking the muscles, used especially for nervous diseases.

Mas′tiff. A large dog, noted for its strength and courage, often used for watching houses.

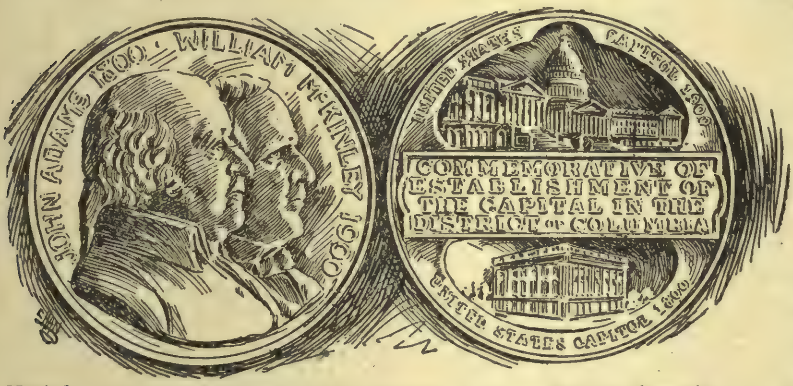
Mas′todon. A kind of large animal allied to the elephant, but larger and with tusks of great length. It was formerly abundant in the United States, and probably lived in the early human period, but is now only found as a fossil.

Match. A small splint of wood, tipped with some very inflammable composition, which bursts into flame upon friction. The first used were brimstone matches, tipped with sulphur. In 1829 an English chemist discovered friction matches, and the making of matches is now an important industry. The best wood for matches is white or yellow pine. The wood is cut into blocks, and the blocks into square splints. The splints are dipped into melted sulphur, and afterwards into phosphorus, mixed with nitre, fine glue, etc. *Safety matches* can be kindled only by rubbing upon the side of the box, on which the phosphorous composition is glued.

Mat′tock. [AS. *mattuc*, a shovel.] A tool of husbandry, used for digging and grubbing up roots of trees and weeds.

Mat′tress. [O.F. *materas*.] A quilted bed, stuffed with hair, wool, or other soft material, instead of feathers.

Ma′vis. [Fr. *mauvis*.] A thrush; properly the song-thrush, not the screech-thrush.



Medal. A circular piece of metal stamped or engraved with a head or design upon it and issued usually to celebrate or mark some great event.

Meer′schaum. [Ger. *meer*, the sea; and *schaum*, foam.] A light, soft magnesian mineral, used in Turkey and Germany in the manufacture of tobacco-pipes.

Mel′on. [Fr., from L. *melo*.] A plant of the Gourd family, to which the cucumber also belongs. It is an annual, with trailing stems, angular leaves, yellow flowers, and bearing a large juicy fruit, which possesses a delicious flavor. It is largely cultivated. The native country of the melon is unknown, but there are numerous varieties found throughout Europe, Asia, and America. The two principal kinds of melons in the United States are the musk-melon and the water-melon (*citrullus*).

Mem′brane. [Fr. *membrane*.] A thin organ, resembling a supple elastic web, serving to secrete a fluid, or to separate, envelop, and form other organs.

Mer′cury. [L. *mercurius*.] A metal of a silvery-white color, also known by the name of quicksilver. It is a liquid at ordinary temperatures, becomes solid at 39° below zero F. and boils at 662° F. Small drops of the pure metal are sometimes found, but its common ore is cinnabar (mercury sulphide), composed of mercury and sulphur. Mercury unites with most metals to form alloys called amalgams. These are very extensively used in the processes of silvering and gilding, in the production of vermilion, and in extracting gold and silver from their ores. Mercury is used in making barometers and thermometers, and in various medicines. Cinnabar, the ore from which mercury is chiefly obtained, is found in Almaden (Spain), Illyria, and the Ural Mountains, and in California, Peru, China, and Japan.

Mer′cury. The smallest planet, and the one nearest to the sun; its distance being 36,000,000 miles. It is 2,992 miles in diameter, and moves around the sun at the speed of 105,000 miles an hour, its year being equal to 88 of our days. Its period of rotation on its axis is not known.

Merid′ian. [L. *meridies*, mid-day.] A great circle thought of as passing through the North and South Poles, and also through any place on the earth's surface. Thus every place has its own meridian, and it is mid-day at any place on the earth's surface when the centre of the sun comes upon the meridian of that place.

Meri′no. [Span.] A breed of sheep with fine wool; originally in Spain, now largely raised in the United States and Australia; also the name of a cloth made from this wool.

Merry-thought. A forked bone between the neck and breast of a fowl; so called from being that which two persons pull at in play. The one who breaks off the longer part has the omen of being first married. Also called wish-bone.

Met′als. [L. *metallum*.] Minerals having certain properties, the chief of which are—1. They are all opaque, and they all have a shiny surface known as the *metallic lustre*. 2. They are good conductors of heat and electricity. 3. With the exception of gold and copper, their color is a grayish white. 4. With the exception of mercury, they are all solids at ordinary temperatures. 5. All metals can be melted, but the temperatures at which they assume the fluid form vary very much. 6. Great weight, most metals being heavier than water. Platinum is more than twenty times as heavy as water. Metals differ from each other in malleability, ductility, and tenacity. A metal is said to be malleable when it can be hammered out into thin sheets. Gold is the most malleable, and next to it in order are silver, copper, platinum, iron, tin, zinc, and lead. Some metals are so brittle that they cannot be hammered at all. When a metal can be drawn out like wire, it is ductile. Gold is the most

ductile of all metals. When a metal has the power of holding together under a strain, it is said to have tenacity. Iron is the most tenacious or elastic of all metals.

Me′teor. [Fr. *meteore.*] Any natural phenomenon in the atmosphere or clouds; applied particularly to a fiery or luminous body occasionally seen moving rapidly through the atmosphere, and to a fireball; called also a *falling star.* (*q.v.*)

Me′tre. [Fr. *metre.*] Unit of the metric system of length, equal to 39.37 English inches.

Mi′ca. [L. *mica*, a small bit.] A mineral found in granite and most of the other primary rocks. It easily divides into glittering plates of great thinness. It is so transparent that it is used in Siberia, China, Peru, and other countries as a substitute for glass in windows. Mica is sometimes preferred to glass for lanterns, and is also used for doors of stoves, as it is not so liable to break with sudden changes of temperature.

Mi′crophone. An apparatus for magnifying very faint sounds, by variation of electrical resistance. It forms the basic principle of the carbon telephone transmitter.

Mi′croscope. [Gk. *mikros*, small; and *skopein*, to see.] An instrument for viewing objects which are too small to be seen with the naked eye. A simple microscope consists of a tube having one convex lens, which magnifies the object; while a compound microscope has two convex lenses in a tube, one of which is called the object-glass, and the other one the eye-glass. In the compound microscope the thing looked at is first magnified by the object-glass, and this is again magnified by the eye-glass. The microscope is an interesting and wonderful instrument, and by its means many living things invisible to the naked eye are revealed. The microscope is also applied to the study of rock structure by grinding down the stone to thin sections. Preparations for the microscope are preserved on glass slips (3x1 in.) covered by very thin glass fastened by Canada balsam or shellac.

Mignonnette′. [Fr. *mignonnette.*] An annual plant and flower prized for its delicate and agreeable fragrance.

Milk. [AS.] A white fluid secreted in the mammary glands of the females of all mammals. When examined under the microscope, milk is seen to consist of a clear fluid, filled with round floating balls of fat of very minute size, each one enclosed in a separate film or thin skin of albumen. When milk has stood for some time these balls of fat rise to the surface, and form a layer of cream. When cream is churned the cases of the balls are broken, and the fat runs together and makes butter. Skimmed milk is that which remains after the cream is removed. Condensed milk is prepared from that of the cow, sweetened with sugar and boiled down until the water is out of it, thus forming a thick, sweet paste, which is sealed up in tin cans.

Mil′let. [Fr., from L. *milium.*] The name of several kinds of grasses bearing a great number of small round seeds used as food. The common millet is a native of the East Indies, but is also cultivated in the warmer parts of Europe, Africa, the United States, and the West Indies. The seeds are ground up into meal for bread. Certain kinds of millet bear seeds used as food for cattle, poultry, and cage-birds.

Milk′weed. A family of plants found in North and South America, which are full of milky juice. The seeds are covered with a silky down, which has been mixed with cotton and woven into cloth. The root is used in medicine.

Milky Way. A broad, luminous belt encircling the sky, and shown by the telescope to be made up of a countless multitude of suns, so immensely distant as to be very dimly visible. There are probably more than a thousand millions of suns in this wonderful belt.

Mimo′sa. [Gk. *mimos*, imitator.] A genus of leguminous plants, including among its species the sensitive plant, so called from its seeming to imitate the sensibility of animal life.

Mine. [Fr. *mine.*] A subterraneous work or excavation for obtaining metals, metallic ores, or other mineral substances. The deepest mine is the Spensenberg, near Berlin, 4,175 feet.

Min′eral. [It. *minerale.*] A natural body destitute of organization or life; a substance found in or on the earth which is neither animal nor vegetable.

Mineral Waters. Waters or springs impregnated with mineral substances.

Mink. A quadruped of the Weasel tribe, often called minx, and valued for its fur, which is of a chestnut-brown color. It is found in the cold parts of North America, Europe and Asia, living on the banks of rivers and lakes, and feeding on small birds, fishes, frogs, and mussels.

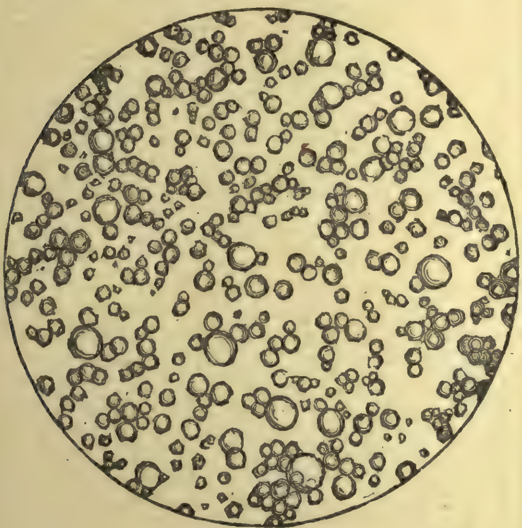
Min′now. [Fr. *menu*, small.] The name applied to several species of very small fishes found in fresh-water ponds and rivers. Minnows average from 2 to 3 inches in length, and feed on aquatic plants, worms, insects, and small snails. They are generally caught by a small hand-net, and used as bait to catch other fish.

Mint. [AS., from L. *mentha.*] The name of a strongly-smelling plant, with flowers in whorls. Numerous species are known, widely distributed over the world, but the most important are spearmint and peppermint. Spearmint is the common mint found in gardens, and is largely used in making mint-sauce and for flavoring soups. The oil of mint is distilled from the leaves, and from

the oil are made the essence of mint and mint-water. Peppermint is cultivated chiefly for the oil which it yields, so much used for flavoring confectionery and for making cordials and essences. Essence of peppermint is made by mixing the oil with alcohol, and is used in medicine.

Mi′rage. An optical illusion often seen in hot climates, especially in deserts. Travelers apparently see a broad lake with surrounding trees, where only desert sand exists. It is a phenomenon of refraction.

Mir′ror. [Fr. *miroir.*] A plate of glass lined at the back with a brilliant metal, so as to reflect the image of any object placed before it. Mirrors are made by coating the back of a sheet of plate-glass with an amalgam of mercury and tin-foil. In ancient times mirrors were made of polished metal. Ordinary mirrors have flat surfaces, but there are also *convex mirrors*, which cause the rays of light to diverge and decrease the size of the reflected image, and *concave mirrors*, in which the rays are reflected to a focus and the image magnified. Beyond the focus it is inverted.



MILK UNDER THE MICROSCOPE

Mist. [AS.] Moisture visible in the air; rain in very fine and almost imperceptible drops. (See *Fog.*)

Mis′tletoe. [AS. *mistelta.*] An evergreen plant that grows on the branches of many kinds of trees. In winter it is covered with small white berries. This plant was held in great veneration by the Druids and is now used in the Christmas festivities.

Mi′tre. [Fr., from Gk. *mitra.*] A crown or head-dress worn by archbishops and bishops during solemn church services.

Mitre-joint. The joint made by the ends of two pieces of wood fitted together at a right angle, as in the corners of a picture-frame. The mouldings are usually sawn in a *mitre-box*, the sides of which have saw-cuts through them at an angle of 45° to guide the saw in cutting.

Moc′casin. A venomous snake of the United States, resembling the rattlesnake, but without a rattle. The name is sometimes given improperly to the copperhead. Also the shoe of buck skin formerly worn by the Indians.

Mock′ing-bird. A bird which gets its name from its habit of imitating the songs of other birds. It is a kind of thrush, found only in North and South America and the West Indies. Its form is graceful, but its plumage is not very handsome. Its own song, which is sweet and pleasing, is heard mostly at night. During the day it imitates the songs of other birds, passing from one to another with the greatest ease, now warbling like a canary or blue-bird, then cackling like a hen or screaming like a swallow. It can imitate various other sounds, and readily learns to whistle a tune. Mocking-birds feed chiefly on berries and insects, are easily tamed, and live happily in cages if caught when young.

Mo′hair. [Fr. *moire.*] The hair of a kind of goat found in the neighborhood of Angora, in Asia Minor, and now also at the Cape and in California. The covering of this goat is a long, soft, silky, pure white hair or wool, which is woven into varieties of camlet, shawls, and trimmings, and in France into a fine kind of lace.

Molas′ses. [L. *mellaceus*, honey-sweet.] The thick liquid of the juice of the sugar-cane, which separates from it in the process of manufacture. (See *Cane Sugar.*)

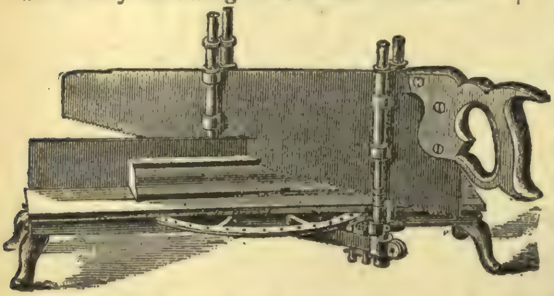
Mole. [O.E. *mold warp*=thrower-up of mould or earth.] The mole is found in Europe, Asia, Africa, and North America; but is not found in Ireland or in the Western Isles of Scotland. From its habits and mode of life it is one of the most interesting of mammals. It lives underground, and seldoms sees the light. Its food consists of earthworms and the larvæ of insects. It has a long cylindrical body, very short limbs, and a pointed snout. Its forearms, hands, and claws are shaped into strong tools for scraping, digging, and shoveling away the earth. The eyes are completely hidden in the fur, and though the sense of sight is probably very imperfect, the senses of hearing and smelling are very acute. Moles in making their tunnels damage the roots of plants, but they are very useful in destroying a vast number of grubs, which would otherwise feed on and do more damage to the roots than the moles.

Mollus′ca. [L. *mollis*, soft.] The animals included in this group have soft, inarticulated bodies, usually inclosed in a shell, the body covered with a sensitive contractile skin, kept moistened by a viscid fluid which exudes from it. In one large division of molluscs (gastropods) the under surface of the body is covered by a broad fleshy disc or foot, on which the animal glides slowly along. Snails and slugs possess this foot. Of the shell-covered molluscs some live in univalve, others in bivalve, or multivalve shells. To the bivalves belong, oysters, mussels,

and cockles; to the univalves snails, whelks, cowries, limpets, etc. The shells of the former class are joined by a hinge, and the inhabitant has the power of opening and closing the valves at will. Many of the inhabitants of the univalve shells have a horny or shelly plate attached to their bodies, which serves the purpose of a door when the animal retires within its house. This is well illustrated in the common periwinkle.

Mon′ey. [L. *moneta.*] Stamped metal, generally of gold, silver, or copper, used in traffic, or as the measure of price. The term *money* is now applied to whatever serves as a circulating medium, including bank notes and drafts, as well as metallic coins.

Mon′key. [Ital. *monicchio.*] The name of a family of animals found in the tropical parts of America, Asia, and Africa. They resemble man more than any other animals, both in their outward form and in their skeletons, and they sometime act very much like man. They live mostly in trees, which they climb with great ease. Their food consists of fruits, nuts, and insects. They are cunning and mischevious, and, if the higher apes be included, are the most intelligent of the animals below man. Many of the American apes have prehensile tails, by the aid of which they can swing from branch to branch.



MITRE BOX AND SAW

Mon′ogram. [Gk. *monos*, alone; and *gramma*, a letter.] One, two, or more letters interwoven as a cipher or abbreviation of a name, and used in seals, coats of arms, etc.

Monsoon′. [Ital. from Arab. = a time or season.] The wind that blows over the Indian Ocean from the north-east from October to April, and in the opposite direction during the rest of the year.

Month. [AS. *monadh*, from *mona*, the moon.] The twelfth part of the calendar year—popularly the space of four weeks. The *calendar* month has 30 or 31 days, except February, which has 28, and in a leap year 29; the *lunar* month is 29 days 12 hrs. 44 min. 2.684 sec; and the *sidereal* month is 27 days 7 hrs. 43 min. 11.545 sec.

Moon. [AS. *mona.*] The globe or satellite which moves round the earth and reflects the light of the sun upon it. In form it is an almost perfect sphere of 2,163 miles in diameter, and revolves at a mean distance from the earth's centre of 238,840 miles. The moon presents as large a surface to the eye as the sun, but it is really many million times smaller, and looks as large only because it is so much nearer. It moves round the earth in a nearly circular orbit in a little less than a month. The time occupied by the moon in passing from one star to the same star again is called a *sidereal* month. For every revolution in the moon's orbit it rotates once on its axis, so that one side of the moon is always invisible to the earth. At times, however, owing to its vibratory motion, we see a little more than the side which usually faces the earth. When the moon is between the sun and the earth, it is invisible, and on becoming visible is called "the new moon," and when the earth is between the moon and the sun, the whole surface becomes visible, and in this state we have what is called "full moon." The interval from new moon to new moon again—that is, the time occupied by the moon in passing from the sun round to the sun again—is called the *synodic* month. It is longer than the sidereal month, its mean value being 29.53 days nearly, and this is the length of the *ordinary lunar* month. From "new" to "full" the moon increases in apparent size, and then begins to decrease in size, until it returns to the condition of the new moon. In the phases before and after new moon a faint illumination of the part not directly lighted up by the sun is visible. This is called the "earth shine," and is due to the reflection of light received from the earth. An eclipse of the moon takes place when it gets into the shadow of the earth, and an eclipse of the sun when the moon comes between the sun and the earth. To the naked eye the surface of the moon presents a mottled appearance, some parts being light and others dark. Viewed through a telescope the surface appears to be covered with mountains, valleys, and plains, like the surface of the earth; only in the moon everything is barren and desolate, like the country around volcanoes, and there are no seas, lakes, or rivers. The harvest moon is the full moon that occurs nearest the autumnal equinox (Sept. 23). (See *Eclipse.*)

Moose. The largest of the Deer family, equal in size to the horse, and standing very high. Its broad antlers weigh from 50 to 70 pounds. It is found in northern New England and Canada, and closely resembles the elk of Europe.

Mor′dant. [Fr., from L. *mordere*, to bite.] A substance, such as alum, for making colors firm and permanent. In *gilding*, the size used to make gold-leaf adhere.

Moroc′co. [*Morocco*, in North Africa.] A fine kind of leather made from goat-skin. It includes imitation French kid, brush kid, glazed kid, pebbles, straight-grained goat, and oiled goat. (See *Leather.*)

Mor′tar. [L. *mortarium.*] Sand with slaked lime and water, mixed thoroughly into a paste, and put between stones and bricks to fasten them together. (See *Cement.*)

Mor′tise. [Fr. *mortaise.*] A hole or hollow cut in one piece of timber to receive the end of another piece made to fit, called the *tenon*. The junction of the two pieces is called a *mortise-joint*, and

is much used in putting together the frames of houses, and in making doors and shutters.

Mosa'ic. [L. *musivum opus*, mosaic work.] Ornamental work formed of small pieces of colored marble, precious stones, or glass, laid in figures or patterns, attached by being bedded in cement.

Mosqui'to. [Span., from L. *musca*, a fly.] A species of gnat that abounds in marshes and woods, and whose sting is very painful. They are very widely distributed, being found in the coldest as well as in the hottest countries. A long proboscis or sucker projects from the head, with several little bristles or lancets sharper than the finest needle. These bristles prick the skin, and the insects draw up the blood through the proboscis, and a poisonous juice is squirted into the wound, which causes great itching, and sometimes a bad sore. It is supposed also that the microbe of malaria is thus implanted in the blood of man. Mosquitoes feed chiefly on the juices of plants, rarely on blood.

Mosses. (*Musci.*) A class of small flowerless plants, with simple branching stems and numerous narrow leaves. There are about 3,000 species, growing chiefly in cool and rocky regions, and also in bogs and swamps. Cold swamps are everywhere being filled with sphagnum and other mosses, whose remains accumulate, and are in time condensed to peat—a valuable fuel where wood and coal are scarce.

Moth. [AS.] An insect like a butterfly, but without thickenings on its antennæ, seen mostly flying about at twilight or during night. There are many kinds, and they vary in form, size, and color. The clothes-moth, the larvæ of which eat holes in clothing, carpets, and furs, is among the smallest of moths.

Moth'er-of-pearl. The hard, silvery, brilliant substance, called nacre, which forms an internal layer in several kinds of shells. Most of it is got from the shells of the pearl oyster, brought in considerable quantities every year from the East Indies, South America, and the Pacific Islands, and manufactured into knife handles, buttons, studs, and ornaments. It is also used in inlaying and for *papier-mache* work.

Mound Builders. The ancient Indians who erected the earth-mounds, so common in the Mississippi and Ohio Valleys. They are thought to have been the ancestors of some of the present tribes, especially those of the Southern States.

Mouse. [L. *mus.*] A small and well-known quadruped, found in almost all countries, and infesting dwelling-houses, granaries, and fields. The common house-mouse is a timid and harmless animal, but often does much mischief. The field-mouse and the harvest-mouse are the pests of farmers, causing much destruction of growing grain.

Mul'let. [Fr., from L. *mullus.*] A fish, often found in river-mouths and near the coast, which eats mud for the organic *debris* it contains, and is highly esteemed as food. The chief kinds are the red mullet and the gray mullet.

Mul'berry. [AS.] A genus of trees bearing a succulent mass of fruit of a purplish-black color and fine aromatic flavor. The fruit is much esteemed for dessert, and a pleasant light wine and an excellent preserve are made of it. The leaves of the mulberry are used for feeding silkworms.

MULBERRY LEAF AND WORM.

Mule. [AS., from L. *mulus.*] An animal which is a half-breedb etween the male ass and female horse. The head, ears, and tail resemble those of the ass, but in bulk and height the mule is nearer the horse. It is very sure-footed, and of great value for traveling in mountainous countries. Mules are largely used as beasts of burden in Spain, Portugal, Italy, and Spanish America; and in some of the southern States of North America they are employed for work on plantations. In recent wars mules have been found most useful transport animals.

Mul'lion. [Fr. *moulure.*] The upright bar or division between the lights of windows, screens, and panels in Gothic architecture.

Mum'my. The preserved body of a human being or animal. In Egypt the bodies were preserved by a process of embalming; and multitudes of mummies exist thousands of years old. In ancient Peru the same effect was produced by sun-drying. Dried bodies are also found in the Cliff Dwellings of the Western United States.

Mus'cle. [Fr., from L. *musculus.*] The fleshy parts of the body, which have the power of contracting and of moving the joints with which they are connected. Muscles are *striated* and voluntary, or *non-striated* and involuntary. They are composed of fibres laid side by side, forming bundles, which are attached to the bones by tough whitish strings called sinews or tendons. The various bones of the body are moved by about 400 muscles.

Mush'room. [Fr. *mousseron.*] A fleshy plant belonging to the fungi, with a short white stalk and a flat or rounded head, umbrella-shaped, which grows up in pasture-fields sometimes in a single night. Many kinds can be eaten, and some are used in making ketchup.

Musk. [L. *muscus.*] A substance with a strong and persistent odor, obtained from the male of the musk-deer, which inhabits the mountainous parts of Central Asia. Musk is one of the strongest of all perfumes, and is much used by perfumers.

Mus'ket. [Fr. *mousquet.*] The name formerly given to the common gun in the hands of soldiers, which was then discharged by means of a lighted match, but in which a spring-lock is now employed. (See *Rifle.*)

Musk-ox. A ruminating animal, between the sheep and the ox in character, found in the northern parts of America and even in the northernmost part of Greenland. Warmth is obtained from its very thick hair. When fat the flesh is well flavored, but musky in smell.

Musk-rat. The name of two distinct species of animals, one found only in America, much hunted for the sake of its fur, from 400,000 to 500,000 skins being annually imported into Britain; the other common in Europe. Both exhale a very strong odor of musk.


MUSSEL.

Mus′lin. [Fr. *mousseline*, from Mosul in Asiatic Turkey, where this cloth was first made.] A fine, thin kind of cotton cloth, of a light and soft texture, and not woven so compactly as calico.

Mus′sel. [L. *musculus.*] The name applied to several common bivalve shell-fish, of which the common sea-mussel is the most important, and is largely used as bait for deep-sea fishing. In some districts of Europe it is used as an article of food. Near Rochelle, in France, there are large "mussel farms," and hundreds of people are employed in planting and gathering the mussels.

Mus′tang. The name given to the small wild horses of Texas, California, Mexico, etc.

Mus′tard. [L. *mustum.*] The seeds of the mustard plant ground to powder and used as a seasoning for meat. The mustard plant is an annual, about 3 feet high, with sweet-smelling yellow flowers and seeds in little pods.

Myrrh. [L. *myrrha.*] A pleasant-smelling gum-resin obtained from the sap of the myrrh-tree, which grows in Arabia and Abyssinia. It is used in medicine as a tonic for disorders of the digestive organs, to cleanse wounds, and as a tooth powder when the gums are spongy.

Myr′tle. [L. *myrtus.*] A tree or evergreen shrub, with beautiful white flowers, shining leaves, and pleasant smell. The ancients considered it sacred to Venus, and her temples were surrounded by groves of myrtle trees.

N

Nail. [AS. *nægel.*] A pointed piece of metal, with a round or flattened head, used for driving into wood or other material for the purpose of holding separate pieces together. Formerly nails were made by the hand; complicated machinery is now employed in their manufacture. Nails vary in size and shape according to their different uses. They are now usually made of wire.

Nail. The horny scale on the fingers and toes of man. (See *Hoofs* and *Claw.*)

Nankeen′. [*Nankin*, in China.] A brownish-yellow cotton cloth made from a kind of cotton which grows in China. Imitations of this cloth are made in Great Britain and America, and are dyed yellow instead of being made of the cotton of that color.

Nap. [AS. *hnoppa.*] The soft downy surface of cloth; so called because, before it is dressed, it is composed of many little loops or knobs, which are afterwards cut and smoothed.

Naph′tha. [Pers. *nafata*, to exude.] A volatile bituminous liquid, of a strong peculiar smell, and very easily set on fire. When occurring naturally it is called rock oil or crude petroleum, and it is also obtained in the refinement of petroleum. It is used for illumination and to dissolve varnishes, etc. *Coal naphtha* is obtained by the distillation of coal tar, *boghead naphtha* from coal, and *wood naphtha* from wood.

Nap′kin. [Fr. *nappe*, a tablecloth; and *-kin*, little.] A small cloth; a cloth used for wiping the fingers and mouth at table.

Narcis′sus. [Gk. *narkissos.*] A class of bulbous plants to which daffodils belong, cultivated for the sake of their fragrant and beautiful cup-shaped flowers, which possess narcotic properties.

Nar′whal. A marine mammal belonging to the Dolphin family, chiefly found in the Arctic seas. It is generally from 20 to 30 feet long, and is armed with a horny projection from the upper jaw, 6 to 10 feet long, and harder and whiter than ivory. It has sometimes two of these horns or tusks, but though thus armed is a very peaceable animal.

Nastur′tium. [L. *nasus*, the nose; and *torqueo*, to twist, in allusion to its pungent taste causing pain.] A plant cultivated both for ornament and use. It is a kind of cress, with white or yellowish flowers and a warm, pungent taste. The flowers are used in salads, and the seeds as a substitute for capers.

Nau′tilus. [Gk. *nautilos*, sailor, or shell-fish supposed to have a membrane which served as a sail.] A genus of shell-fish having a spiral shell, chambered with simple partitions perforated in the centre, concave towards the outlet of the shell. The outer chamber is the largest, and contains the body of the animal. The head of the animal has many simple tapered arms or tentacles. Four kinds are found living in the tropical Pacific, but there are many fossil kinds. It creeps along the bottom of the sea, and does not sail on the surface, as was formerly supposed.

Neb′ula. A vapory patch of seemingly gaseous matter seen in the heavens among the stars, and sometimes of immense dimensions. Many of the supposed nebulæ have been shown to be clusters of very distant stars, but others are proved by the spectroscope to be made up of luminous gas. Great numbers of them exist.

Nee′dle. [AS. *nædl.*] The sewing-needle is a small instrument of fine steel wire, pointed at one end, with an eye at the other to receive a thread. In needles for sewing-machines the eye is at the pointed end. The *magnetic needle* is a

small piece of steel, pointed at both ends, and used in the mariner's compass. By its magnetic properties it is attracted and directed to the poles.

Nep′tune. The planet most distant from the sun, its distance being about 2,746,000,000 miles. Its diameter is about 37,300 miles, and its year equals 164.6 of our years. It has one known satellite, which revolves around it in a direction opposite to that of the satellites of the other planets.

Nerves. [L. *nervus*.] All the organs of the body are connected by nerves—each a bundle of nerve fibres enclosed in a special sheath—either with a great mass of nervous matter called the brain, or with a long thick nerve called the spinal cord, which runs down the centre of the back-bone. Delicate white threads or nerves pass from the brain through little holes in the skull to the ears, eyes, nose, mouth, etc. Long but very fine nerves extend from the spinal cord to all parts of the body. By the nerves sensations or feelings are transmitted to the brain. If the nerves going from the tip of a finger to the brain are cut, we can no longer feel anything with that finger. Again, if any part of the skin is touched, the sensation passes along a nerve to the spinal cord, and then up that great nerve trunk to the brain. But the nervous system does more than merely receive sensations. All the movements of the muscles are directed and governed by the nerves, and similarly the action of all the other organs of the body is under the control of the nervous system.

Net. [AS.] A fabric made of hemp, flax, or jute twine, and sometimes of cotton and other materials, worked into open meshes, and used in capturing fish, birds, butterflies, and small quadrupeds. Many kinds of nets are used by fishermen, but those most in use are the seine, drift, and trawl nets.

Net′tle. [AS. *netele*.] A genus of plants covered with extremely fine, sharp hairs, which pierce the skin when touched, and inject into the wounds an acrid juice, often causing much inflammation and pain. The fibre of the nettle is very strong, and in some countries it is woven into cloth. The stalks and leaves are used in some parts of England for the manufacture of *nettle-beer*.

New′el. The upright post about which the steps of a circular staircase wind; hence, in stairs having straight flights, the principal post at the foot of a staircase, or the secondary ones at the landings.

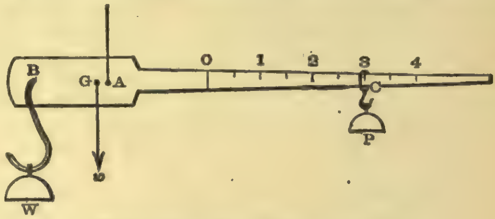
Newt. Any one of the several species of small aquatic salamanders; but the term is more commonly applied to the animals which inhabit ponds, wet ditches, and other damp places.

Nick′el. A metal discovered in 1751. It is of a silvery-white color, ductile, malleable, stronger than iron, and almost as hard to melt. Nickel is found in Russia, Norway, Germany, New Caledonia, Canada, and the United States. It does not tarnish by exposure to moist air, is very susceptible of magnetism, and magnets are made of it. Nickel is used for plating other metals, to which it gives a beautiful silver-like surface that keeps them from rusting. Nickel is used with steel wrought into armor plates for warships. German silver is an alloy of nickel, copper, and zinc, and some white compounds used for small coins are similar alloys.

Night′ingale. [AS. *nihtegale*.] A small European bird, rather larger than the hedge-sparrow, of a rich russet-brown color, and noted for its vocal powers. It sings in the evening, and the sweetness of its song is celebrated by the poets.

Ni′tre. [Fr. *nitre*.] Saltpetre. A white crystalline salt, of a cooling, slightly bitter taste, unalterable in the air, and insoluble in alcohol. It is used in the manufacture of gunpowder, in the production of nitric acid, in medicine, as a fertilizer, and for preserving meat.

Ni′tric Acid. The most important oxide of nitrogen. Its chemical formula is N_2O_5. It forms valuable compounds with most of the bases, and is useful also for its powerful oxidizing properties.



STEEL YARD, ALSO CALLED A BALANCE.

Ni′trogen. [Gk. *nitron*, nitre; and *gennao*, I produce.] The gaseous element which forms nearly four-fifths of the atmosphere. When alone or uncombined it does not possess any very active properties. In the air it serves to dilute the oxygen, which by itself would be too strong in its effects on life. Nitrogen is a colorless and transparent gas. It has neither smell nor taste, and it will not readily combine with other elements. It is very slightly soluble in water, and it is neither combustible nor a supporter of combustion, a lighted taper plunged into a jar containing nitrogen being at once extinguished. It forms many most important compounds, such as nitric acid, ammonia, and cyanogen.

Ni′tro-gly′cerine. A liquid appearing like a heavy oil, colorless or yellowish, and consisting of a mixture of several glycerine salts. It is produced by the action of nitric acid on glycerine in the presence of sulphuric acid, and is terribly explosive. When compounded with siliceous earth it forms *dynamite*, and with wood, *lignose*.

Nut. The fruit of certain trees consisting of a hard shell enclosing an edible kernel, differing in size from the beech-nut to the cocoanut—a piece of metal with a grooved hole, screwed upon the end of a screw-bolt.

Nut′meg. [*Nut*, and L. *muscus*, musk.] The kernel of the nut of a tree which grows in the East Indies, much used in cookery because of its pleasant taste and smell.

O

Oak. [AS.] The name of a noble genus of trees, sometimes styled the monarch of the woods. A large proportion of forest trees are oaks, of which there are about 300 different kinds, spread over nearly the whole of the northern hemisphere, except the extreme north. Some oaks shed their leaves every year, and some are evergreens, and the leaves are alternate, but often variously lobed. The timber of the oak is hard and tough, and has been used from the very earliest times as the best material for shipbuilding. It is also employed in architecture, cabinetmaking, mill-work, and coopering, and the bark is used in tanning and dyeing. It bears a well-known nut, called the acorn, which is contained in a small woody cup.

Oats. [AS. *ate.*] The grain of a corn-producing grass, which differs from wheat and barley in the loose arrangement of its spikelets on the stalk, forming what is termed a *panicle*. The oat is a hardy plant, well able to bear cold and moisture. Oatmeal is largely used in Scotland and in North America, and forms a very valuable article of food. Oats are excellent food for horses and cattle.

Ob′elisk. A tall, tapering, four-sided pyramid, cut off at the top in the form of a flat pyramid. Obelisks, made from single stones, of great height, stood before the temples of Egypt, their sides closely carved with hieroglyphic inscriptions.

O′cean. The great body of water which occupies five-sevenths of the area of the earth's surface, and surrounds all the continents. It is divided into the Atlantic, Pacific, Indian, Arctic, and Antarctic oceans.

O′celot. A member of the cat family, smaller than the leopard and the ounce. It is about 3 feet long, and is found in America from Texas to Brazil, and in Sumatra. It climbs trees and feeds on birds and small animals.

O′chre. [Fr. *ocre.*] A fine kind of iron clay, either red (hematite) or yellow (limonite), used with size for painting.

Octupus. (See *Devil Fish.*)

Oil Well. A well sunk to underground beds of petroleum. It consists of iron pipes sunk into the earth, following a drill which cuts an opening downward. Some of these wells are sunk to a great depth, the total number in the whole earth reaching probably 100,000. The oil sometimes flows out and sometimes is obtained by pumping.

Oils. [Fr., from L. *oleum.*] Greasy substances expressed or drawn from various animal, vegetable, and mineral bodies, as olive *oil*, whale *oil*, rock *oil*, etc. They are used for food, for solvents, for anointing, lubrication, illumination, etc. The mineral oils are varieties of petroleum. The vegetable oils are of two classes—*essential oils* and *natural oils*, which in general resemble the animal oils and fats. Most of the natural oils and the animal oils and fats consist of ethereal salts of glycerine, with a large number of organic acids, principally stearic, oleic, and palmitic, forming respectively stearin, olein, and palmitin. Mutton tallow, beef tallow, and lard are rich in stearin, human fat and palm oil in palmitin, and sperm and codliver in olein. Oils are classified according to their properties, and include—(1) non-drying oils, as almond, mustard, olive, etc.; (2) drying oils, as linseed, walnut, poppy, hemp, etc.; (3) train and fish oils, as seal, sperm, whale, cod, etc.; (4) vegetable fats, as palm oil, cocoanut oil, etc.; (5) animal fats, as lard, butter, tallow, etc.; and (6) waxes, as palm-tree wax, bees-wax, etc.

Ol′ive. [L. *oliva.*] A tree or shrub with small oblong leaves, of which there are several species, the most important being the common olive, long cultivated in the south of Europe and Asia for its fruit. The olive has been much improved by cultivation. The oil is used in salads, in the arts, and in medicine, and the fruit for dessert purposes. Olive wood is very hard and is employed for cabinet-work.

Om′elet or **Om′elette.** [Fr. *omelette.*] A food compound, made with eggs beaten up with flour, etc., and fried in a pan.

On′ion. [Fr., from L. *unio.*] A genus of plants, which includes also the garlic, leek, and shallot. The onion is very extensively cultivated, and grows best in a rich and rather moist soil. Its root bears a round or oblong bulb, widely in use as a pot-herb and as a table food. It is very nutritious, and easily digested.

O′nyx. A variety of chalcedony with some resemblance to agate. It is made up of alternating parallel bands of different colors, and was used by the ancients in making cameos, the figures being cut in the white layers, while the darker layers formed the background.

O′pal. [L. *opalus.*] A mineral consisting of silica with a small admixture of alumina. Precious opal presents a fine play of colors, due to its great number of minute fissures, and is highly esteemed as a gem for setting in rings, brooches, and other ornaments. The finest opal comes from Hungary and Mexico. Common opal is semi-transparent, white, yellow, green, red, or brown, and has no play of colors.

Op′era-glass. A small double telescope, with concave lenses of low powers, for seeing clearly rather than magnifying objects at no great distance, such as scenery and buildings, and the interiors of operas, theatres, etc.

O′pium. [L. *opium*, Gk. *opion*, poppy-juice.] A vegetable extract which is the most active of all narcotics, and a valuable medicine. It is obtained from the dried juice of the opium-poppy, which grows wild in many parts of Asia, and is now largely cultivated in India, Persia, and China, and to a considerable extent in some parts of Europe. Much of the opium raised in India is sent to China, where it is largely used for smoking, with baneful effects. As a medicine it relieves pain, allays irritation of the nervous system, and produces sleep. Morphia is the

active principle, and the quality of the opium is judged by the quantity of morphia it contains. Laudanum, a crude preparation of opium in spirits of wine, is the form in which opium is very largely used.

Opos′sum. The name of several kinds of marsupial animals, found only in America. The best known is the common Virginia opossum, found all over the United States. In size it is about as large as a cat, but in shape more like a rat. It has short legs, a very long tail covered with scales instead of hair, except at its base, and a sharp rat-like nose. In some opossums the pouch is absent. In several species the young are carried about on the back of their mother, and with their tails they cling to her tail, which is curved over her back.

Or′ange. [Fr. and Ital., from Pers. *naranj*, with *n* dropped.] An evergreen tropical and semi-tropical tree, seldom rising above 25 feet in height. The fruit is usually round, and consists commonly of ten pulpy parts enclosed in a leathery rind. The flowers, which are of a delicate white color, appear in summer, but the fruit is not ready for picking till the following year. Hence flowers and fruit in various stages may be seen on the trees at the same time. There are numerous varieties of the orange, which is cultivated in all the warmer regions of the earth. In the United States it is raised largely in Florida and California. The blood orange has a reddish juice. The mandarin orange is small, is thought to be of Chinese origin, and is counted a distinct species. The Seville or bitter orange is grown in large quantities in Spain, and imported into Great Britain and the United States for making marmalade. The rind is made into candied orange-peel. The leaf, the flower, and the rind of the fruit all yield volatile oils. The scent of *eau de Cologne* is due chiefly to oil distilled from the orange flower, while the rind of the bergamot orange yields *essence of bergamot*, largely used in perfumery.

Orang′-outang′. [Malayan = man of the woods.] An animal of the ape kind, found in Borneo, Sumatra, and Malacca. It is over 4 feet high, is reddish-brown and closely resembles man in many respects. It dwells only in forests, and moves rapidly from tree to tree.

Or′chid. A family of plants, distinguished by the singular forms of their flowers, which in some cases resemble a bird or an insect. They are prized for their beauty, fragrance and singularity.

Ore. The mineral from which metals are extracted. Metals usually exist in combination with oxygen, sulphur, or other elements; often with other metals. They are extracted from those compounds by the use of heat and various chemical processes.

O′sier. [Fr. *osier*.] The popular name of a species of willow, the long twigs of which are best adapted for basket-making and other wicker-work. (See *Willow*.)

Os′mose. The process which takes place when two fluids of different densities are separated by an animal membrane or by unglazed earthenware. They pass through the partition and mingle with each other, through the action of a kind of molecular attraction.

Os′prey. [L. *ossifraga*; *os*, a bone; and *frango*, to break.] A bird of the family *Falconidæ*, the bald buzzard, fishing-eagle, or fish-hawk, a large bird of prey, living upon fish, which it takes by darting upon them with great rapidity and true aim.

Os′trich. [Fr., from L. *avis*, a bird; and *struthio*, an ostrich.] The largest of all birds, attaining an average height of from 6 to 8 feet. It is a native of the sandy plains of Africa and Arabia. It has long and very strong legs, and only two toes, and is remarkable for its speed in running, and valued for its feathers. Ostriches live chiefly on fruits, grain, leaves, tender shoots, snails, and insects. They swallow stones to grind their food with in the gizzard, and have been known to gulp down pieces of iron, glass, leather, and other hard things. An ostrich egg is very large, weighing about 3 lbs., and is thus equal to about two dozen ordinary hen's eggs. The shell is thick and strong, and is much employed by the South African tribes for water-vessels. The ostrich is now domesticated in South Africa, and bred on farms for its feathers, oil, eggs, etc.

Ot′ter. [AS. *oter*.] A genus of carnivorous aquatic quadrupeds, included in the Weasel family. This animal is larger than others of that family, being often 4 feet long, and differs from them in living mostly in the water. Its paws are webbed for swimming, and its food is chiefly fish. Its fur is short, thick, fine, and quite handsome. Otters are found in almost all parts of the world. The American or Canadian otter is most plentiful in Canada, where thousands are killed every year for their furs.

Owl. [AS. *ula*.] A raptorial bird that howls or hoots at night. The owl has a short, stout form, downy feathers, and a large head with a flat face. The eyes are round and staring, and have a fringe of stiff feathers around them; and the bill is short, strong, and hooked. During the day owls hide away in trees, caves, and old buildings; and in the dusk of the evening, when they see better than in broad daylight, they fly around looking for game. Their food consists chiefly of rats, mice, moles, squirrels, and other

small quadrupeds; but they sometimes feed on other birds, and some of the smaller kinds eat moths, beetles, and other insects. They catch their prey with their claws, and swallow it whole at one gulp. There are many kinds—*barn*, *eared*, *hawk*, *horned*, *screech*, and *snowy* owls.

Ox. [AS. *oxa*.] The general name for the different species and varieties of the ruminant quadrupeds belonging to the genus *Bos*. The species is distinguished by having smooth, hollow, persistent horns, growing on a bony core, by having the body thick and heavy, and the tail long, terminated by a tuft of hair.

METAL BURNING IN OXYGEN.

Ox′ygen. [Gk. *oxus*, acid; and *gennein*, to make.] A gas without color, taste, or smell, forming that part of the air which supports life and flame. It is also the principal component part of water. Oxygen readily combines with almost every other element. Not only does it form about one-fifth of the atmosphere, but it is also found in a great number of solid and liquid compounds. It has been estimated that this element alone forms about one-half by weight of the crust of the earth, being thus the most abundant of all the elements. When we see any substance burning, we may be certain that what we call *oxidation* is going on—that is, that the matter of the coal, or the candle, or the gas, or whatever it may be, is combining with the oxygen of the air, and in the act of doing so is producing heat and light.

Oys′ter. [Fr. *huitre*, from Gk. *ostreon*.] A genus of bivalve molluscs, much esteemed for food. Oysters are distributed very widely, and principally in the seas of warm and temperate climates. They are found on gravel and sand, in estuaries, and on the sea-coast, sometimes attached to rocks, trees, etc., at depths varying from the surface to seventeen fathoms. (See *Clams*.)

O′zone. [Gk. *ozein*, to smell.] A gaseous substance obtained from oxygen; so named from its peculiar odor, which resembles that of weak chlorine.

P

Pace. [Fr., from L. *passus*, a step.] The distance passed over in walking one step, estimated at 2½ feet, but in measuring distances by stepping it is extended to 3 feet.

Pad′lock. A hanging lock with a clasp which turns on a hinge at one end, and, passing through a staple or link, receives the bolt through an opening in its other end.

Paint. [Fr., from L. *pingere*, to paint.] All paints are made up of the substance which gives the color, usually called the pigment, and that with which the color is mixed. Pigments are mostly made from minerals, but some are got from vegetables and some from animals. Paints are mixed either with oil or water, and are therefore called oil-paints or water-colors. Oil-paints are usually mixed with linseed oil, but sometimes some kinds of nut oils are used. Water-colors are mixed with water and a little glue or gum.

Palan′quin. A covered litter used in China, India, etc., borne on the shoulders of men.

Pal′ette. [Fr., from L. *paletta*, dim. of *pala*, a spade or shovel.] A little thin, oval board, or slab of ivory or porcelain, on which a painter mixes his colors, and which he holds by a thumb at one end.

Palm. [L. *palma*.] The name of about 1,000 species of plants growing in warm climates. Their stems are erect and slender, often lofty, and generally without branches, crowned at the summit with a tuft of large radiating leaves. Most of them are noted for the variety and utility

PALANQUIN.

of their products. (See *Cocoa; Date*.)

Palmetto. The common name of the palm trees which grow in the southern United States. Then

are several kinds, but the cabbage palmetto, extensively cultivated in the south-eastern States, is the principal one. It grows to a height of from 20 to 30 feet. Its leaves are used for thatching buildings, and for making hats, baskets, mats, etc. As the ship-worm does not attack its wood, the timber is used for wharves and other woodwork under water.

Pam′pas Grass. A tall grass which covers much of the pampas, or great plains of South America. Its leaves, 6 or 8 feet long, hang gracefully over, while from the centre arises the flower-stems, 10 to 14 feet high. It is much cultivated in the north as an ornamental plant.

Pan′nier. [Fr., from L. *panarium*, a breadbasket.] A wicker basket; one of a pair of baskets slung over a horse's back, for carrying fruit or other light articles.

Pan′sy. [Fr. *pensee.*] A name applied to the varieties of *Viola tricolor*, etc., cultivated in gardens under the name of *heart's-ease.* (See *Violet.*)

Pantaloon′. One of the chief actors in a pantomine, who plays the part of a clown. He dresses in wide, long, garments—a kind of close long trousers, worn by males, extending from the waist to the feet.

Pan′ther. [Gk. *panther.*] A fierce flesh-eating African quadruped of the size of a large dog, spotted like a leopard, but darker in color. The Puma is often called the American Panther. (See *Leopard.*)

Pan′tomine. A theatrical exhibition in which there is no conversation, the plot being indicated by gestures and scenic effect. Its characters are taken by adepts in mimicry and gesticulation.

Papaw′. A small fruit tree of the south and southwest United States. Its fruit is a pod 3 or 4 inches long and an inch thick, with two rows of large flat seeds. It has a yellow skin when ripe, and looks something like a banana. Its flesh is softer and sweeter than the banana.

Pa′per. [L. *papyrus.*] Paper may be described as thin layers of fine vegetable fibre. It is made from the following materials: linen and cotton rags, refuse flax and hemp, jute, esparto grass, straw, soft wood, and waste paper. In America so considerable a quantity of wood is used that it is said the spruce is being depleted from many forests for this purpose. Esparto grass which grows in the south of Spain and the north of Africa, is the staple fibre used in Britain in the production of *machine-made* printing and ordinary writing-paper. Writing and printing papers can be made on the same machine, but their composition and character are totally different. *Printing-papers* require to be comparatively soft, open, and spongy, so as to absorb the ink freely; whereas writing-papers require to be stiff, hard, and non-absorbent. The best *writing-paper* is made wholly from rags, but very good is made from combinations of rags, wood, straw, or esparto. Names or devices or *water-marks* are put on the paper while it is traveling, in the form of half-moist pulp, upon the "wire" of the paper-making machine. A light spider-ringed roll, covered with wire-gauze, and having the name or device projecting from its surface, is made to revolve upon the top of the pulp, leaving its stamp or impression upon it; the water at the same moment being immediately withdrawn, leaves the depression permanent, and thus water-marks are simply thin portions of the sheet, varying in outline as letter or device stamps itself upon the pulp on the machine. The webs of paper from the machine are then cut into sheets of different length and width as required, and examined for imperfections. The recent development of book illustration requires a highly-finished paper, which is passed through a slight mist or fine spray and then run through a super calender. Writing-paper is glazed under heavy pressure between sheets of copper or zinc.

Pap′ier-ma′che. [Fr. *papier*, paper; and *mache*, mashed or chewed.] Paper mashed into pulp, and after being mixed with size or glue formed into various shapes by molds—as tea-boards, trays, and ornamental articles—and japanned when dry.

Par′achute. [Fr. *parer*, to guard; *a*, against; and *chute*, a fall.] An instrument in the form of an umbrella, which enables a person, by its resistance to the air, to drop down safely from a balloon.

Par′affin. Fr., from L. *parum*, little; and *affinis*, related to.] A white substance of the nature of wax. It is got from shale, coal-tar, petroleum, etc., and is *unattacked* (hence its name) by such powerful oxidizing agents as nitric and chloric acid. The lighter and more volatile portions of petroleum are used as solvents for gums, fats, resins, etc.; and the less volatile portions are used for illuminating and for lubricating, or are converted into *vaseline* or *paraffin* wax, from which candles are made.

Parch′ment. [Fr., from L. *pergamena; Pergamos*, in Asia Minor, where it was first made about B.C. 190.] The skin of a sheep or goat dressed and prepared for writing on. Parchment used for covering drums is made from the skins of asses, calves, or wolves, those of wolves being the best.

Par′rot. [Fr. *perroquet.*] The type of a large group of tropical birds, of numerous species, noted for their beautiful color and powerful hooked and projecting bill, which is used for crushing seeds and fruits. Parrots use their bills as well as their claws in climbing trees, and use their feet to carry food to their mouths. Those usually kept as pets are the South American parrot, and the gray parrot, with scarlet tail, from West Africa. The latter is noted for its tameness, mischievousness, and power of imitating sounds. It is easily taught to whistle and to speak. Parrots live to a great age, instances being on record of these birds attaining an age of seventy or more years.

Pars′ley. [Fr., from Gk. *petros*, rock; and *selinon*, a kind of parsley.] An aromatic herb, with finely-divided leaves, used for seasoning soups and for dressing dishes. It is a native of the south of Europe.

Pars′nip or **Pars′nep.** [L. *pastinaca.*] An aromatic herb, cultivated for the sake of its root, which resembles a carrot, and is highly nutritious.

The flesh of cattle fed on parsnips is excellent, and the butter of dairy cows fed on them is superior to that produced by other kinds of winter feeding.

Par′tridge. [Fr., from Gk. *perdix*.] A family of birds which includes also the quail. The common or gray partridge is found throughout Europe. Its flesh is much liked, and the bird is the delight of the sportsman. The red-legged partridge of southern Europe is found also in Asia. In the United States the quail is often called by the name of partridge. The partridge of New England is the ruffled grouse; the spruce partridge is the Canada grouse.

Pas′sion-flower. A beautiful climbing plant, remarkable for the elegance and singular form of its flowers, which resemble "a crown of thorns." The roots and leaves are noxious, and are used in medicine.

Pea. [AS., from L. *pisum*, a pea.] A garden and field plant of many varieties, with a papilionaceous or butterfly flower, and fruit in a legume or pod. It is supposed to belong to the south of

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Europe, and has been cultivated in the East from remote antiquity. It is now one of the most common of garden plants, and is largely grown by market-gardeners, who find it a most profitable crop. As an article of food peas are very valuable, containing a large percentage of *casein*, which is a flesh-forming principle.

Peach. [Fr., from L. *Persicus* = *Prunus Persica*, the Persian tree.] A well-known tree and its fruit, a native of Persia, largely cultivated throughout Europe and the United States. The peach tree is of medium size, with finely-serrated leaves and beautiful flowers, which appear before the leaves and diffuse an agreeable odor. The fruit is one of the most exquisite and delicious of temperate climates. In several of the United States there are immense orchards of peaches, and large quantities are sent to the northern markets, while the canning and drying of the fruit form an important industry.

Pea′cock. [AS., L. *pavo*, a peacock.] One of the most beautiful of birds, of a nature similar to the pheasant, with a tail of very long, bright feathers. It is elegant in form and graceful in its movements, with a splendid crest or tuft on the head, while the feathers of its tail are of an emerald green, purple and gold, studded with richly-shaded eye-like markings, and are capable of erection. The female birds are smaller, and not nearly so handsome, being of a sombre brownish plumage, and presenting a striking contrast to the brilliant appearance of their mates. The cry of the peacock is very harsh and loud. Wild peacocks are still plentiful in many parts of India, and in Java, Sumatra, etc., and in these places hunting them forms a favorite amusement of the sportsman. The feathers of the peacock are used for trimming clothes and fans, and for ornamental brushes. Its flesh was eaten in ancient times. The Romans used to think it a great delicacy, and the emperors had dishes served at their feasts made entirely of the brains and tongues of peacocks. But peacocks are not much eaten now, as their flesh is not so good as that of the turkey and other fowls.

Pea′nut. The fruit of a leguminous plant growing in warm countries—also called ground nut and earth nut. The plant is a trailing vine, with small yellow flowers. After the flowers fall the stem lengthens, bends downward, and the seed-pod on its end forces itself into the ground, where it ripens. Peanuts are raised in immense quantities in western Africa, South America, and the southern United States. They are used for food, and yield an oil resembling olive oil.

Pear. [AS., from L. *pirus*, a pear-tree.] The pear-tree is very largely cultivated for the sake of its fruit. The tree grows wild in many parts of Europe, and is now cultivated in all temperate climates. It sometimes attains a height of 40 feet, with a trunk from 2 to 3 feet in diameter. The varieties of pears are very numerous, and though many of them are of little consequence, more than two hundred at the present day are enumerated as fit for the table, and new varieties are being added every year. Pears are preserved by canning, like peaches. The wood of the pear-tree is hard, fine-grained, of a yellowish color, and susceptible of a brilliant polish. It is largely used by turners, and sometimes dyed black and used by cabinet-makers for ebony.

Pearl. [O.E. *perle*.] A white, hard, smooth, shining substance, found in some shell-fish, especially in

the pearl-oyster, river-mussel, and certain univalves. It is highly valued for its beauty, and used as a jewel. The shells are lined with a secretion of extremely thin semi-transparent films, and in due time layers of considerable thickness are formed, which gradually harden into the material known by the name of *nacre*, or mother-of-pearl. Besides the pearl lining of the shells, rounded portions of nacre or *mother-of-pearl* are found in the flesh of the oyster. These are supposed to be formed by the intrusion of some foreign body, such as a grain of sand, around which layers of nacre are deposited one after another, as many as from ten to twelve round pearls of different sizes being often found within one shell. The best pearls are found off the coast of Ceylon, in the Persian Gulf, on the coast of Australia, and on the Pacific coast of America. The pearl-fishing season lasts from four to six weeks. A fleet of about 250 boats is engaged in the fishery, each boat having a crew of thirteen men and ten divers, five of the latter being employed in diving whilst the other five are resting. The work is done very rapidly, as the divers cannot remain much more than a minute under water. Each diver is let down from the boat by a rope, weighted with a stone. The usual depth is from 60 to 70 feet. The most valuable pearls are those which are perfectly round; but these are very scarce, and secure high prices. They are used to form the centre of necklaces. Pearls have been prized as articles of decoration and ornament in all ages of the world. Cleopatra is said to have owned two very large and beautiful ones. Many splendid pearls are owned by the different crowned heads of Europe; but the Shah of Persia is said to have the finest.

Peat. [For *beat;* AS. *betan*, to make *better*, to mend (a fire). Same root as *better*.] A vegetable substance found amidst much moisture, as in marshes and morasses, and made up of roots, stems, and fibres in every stage of decomposition. When cut and dried it is often used for fuel in many places where wood and coal are scarce. The use of peat as fuel in the distillation of Scotch whiskey gives it its peculiar flavor. Charcoal made from compressed peat is superior to wood charcoal, and is capable of being used for smelting iron.

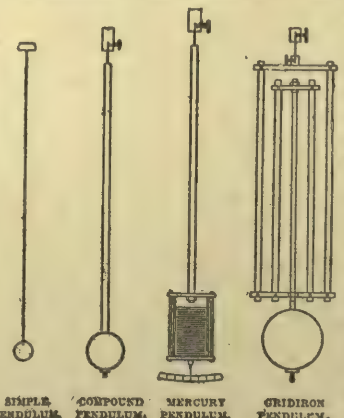
Pec′cary. An American animal allied to the hog, but smaller. There are two species. One—about 3 feet long—extends from Arkansas to Patagonia, the other from Central America to southern Brazil. The latter is extremely pugnacious and its herds are dangerous to meet. Even the jaguar retires before several of these animals banded together.

Pel′ican. [L. *pelicanus*.] A large web-footed water-bird, remarkable for its long, large, flattened bill, to which is attached a bag or pouch for holding the fish taken for food. Pelicans live along the shores of seas, lakes, and rivers. They hover over the water in search of prey, and plunge upon it when it appears, storing it in their pouch until it is full, when they go to some lonely place to bring it out at leisure to eat or to feed their young. Pelicans are natives of the eastern parts of Europe, and of many parts of Asia and Africa. The American white and brown pelicans abound on the Florida coast in winter, but breed on the North American lakes.

Pen. [L. *penna*, a feather.] An instrument for writing with a fluid ink. In ancient times, pens were made out of reeds; but after paper came into use they were made from quills, generally those of the goose and swan, and for extremely fine writing those of the crow. The manufacture of pens from steel was commenced about the beginning of the nineteenth century. Machinery is now largely used in the manufacture of pens, but the finer qualities are finished by hand labor. An ordinary steel pen has to go through some sixteen different processes; while the gold pen, which is incorrodible with ink, and very largely manufactured in the United States, goes through no less than forty-five different processes.

Pen′cil. [L. *penicillus*, a small tail or brush.] A pointed strip of black lead, colored chalk, or slate, usually enclosed in a slight rod of wood, for drawing and writing; but the term is also applied to small hair brushes used by artists, and it was to these that the name was originally given. The best lead pencils are now made in the United States, the purest black lead or plumbago being found there. The wood used for pencils is invariably that of the Virginia or Florida cedar. Colored pencils are prepared by the use of various chalks instead of graphite. The chalk is reduced to powder, mixed with a little hot melted wax, and then pressed and cut into strips of the size required. Slate pencils are thin strips of slate cut out and afterwards rounded. The strips are sometimes cut very thin and put into wood casings like lead pencils.

Pen′dulum. [L. *pendulus*.] An instrument consisting of a weight suspended from a fixed point, and free to swing to and fro by the alternate force of momentum and gravity. It is used to regulate the movements of clock-work and other machinery. The principal kinds in common use are—the simple, the compound, the mercury, and the gridiron pendulums.



SIMPLE PENDULUM. COMPOUND PENDULUM. MERCURY PENDULUM. GRIDIRON PENDULUM.

Pen′guin. A genus of swimming birds included in the Auk family. Penguins exist in large numbers in the Antarctic seas, and along the southern coasts of Africa and South America.

Their front wings, which are without true quills, are too short for flight, and are used as fins or paddles in swimming under water. On shore these birds present a singular appearance, standing erect in long regular lines, resembling files of soldiers. The plumage of the neck is valued for collars and tippets, and large numbers are slaughtered annually.

Pen'ny. [AS.] An English coin, formerly of copper, now of bronze, worth one-twelfth of a shilling. In the New Testament a silver coin of the value of about 7½d. In the United States the name *penny* is often given to the *cent*, a coin of half the value.

Pennyroy'al. A kind of mint found in Europe and very fragrant. The United States pennyroyal is not a mint, but its scent is like that of the European plant and it has the same uses. A tea is sometimes made from it, and its oil is used to drive away flies and mosquitoes.

Pepper. [AS., from L. *piper.*] A common kind of spice, the dried berry of a climbing shrub which grows wild in the East Indies, but is now cultivated in most hot countries. The peppers of Malacca, Java, and especially of Sumatra, are the most esteemed. The berries are about as large as peas, and grow in clusters of twenty or thirty, somewhat like a bunch of currants, each berry containing a single seed. *Cayenne pepper*, first brought from Cayenne, in South America, is made from the pod of the capsicum plant, an entirely different kind of shrub from that which bears black pepper. The pod is green at first, but bright scarlet when ripe, and this gives the pepper its red color.

Pep'permint. A small herb, of a strong spicy odor, much used for flavoring. This, with the spearmint and the pennyroyal, is used in medicine for its stimulant and carminative properties. Others of the mint family are the horse-mint, the brook-mint and the corn-mint, the latter smelling like decayed cheese.

Pep'sin. [Gk. *pepsis*, cooking; *peptein*, to digest.] The active agent in the gastric juice of many animals. For use in drugs it is obtained from the glandular layers of pigs' or calves' stomachs.

Peram'bulator. An instrument for measuring distances, made up of a wheel with an apparatus of clock-work, and a dial-plate upon which the distances traveled are shown by an index; also the name given to a child's carriage, pushed forward by a person walking.

Perch. [Fr., from Gk. *perke.*] The name of several species of fishes of the genus *Perca*, frequenting the fresh waters and coasts of temperate and tropical regions. The fresh-water perch is widely distributed in lakes, ponds, and rivers in Europe, Asia, and North America. It is greenish yellow on the back, and bright yellow on the sides, which are marked with from five to seven blackish bands. The perch is very voracious, devouring smaller fishes, insects, worms, etc. It can exist out of water for a considerable time.

Per'fumes. [Fr., from L. *per*, through; and *fumare*, from *fumus*, smoke.] Scents made from sweet-smelling substances. They are obtained chiefly from plants, but some are got from animals. Vegetable perfumes are made from flowers, herbs, spices, seeds, gums, certain fruits and nuts, and various woods. Perfumes of animal origin are obtained from the musk, ambergris, civet, and castor. Dry perfumes, such as incense and *sachet* powders, are simply gums, resins, dried herbs, etc., pounded or ground to powder. Liquid perfumes are mostly distilled from the different parts of plants. Such perfumes are called essential oils. But the perfumes made from flowers, such as are used on the handkerchief, are mostly made, not by distillation, but by maceration and absorption.

Per'iwinkle. [AS. *pinewincla.*] A sea-snail or small shell-fish, found in abundance between tide-marks on rocks or adhering to sea-weeds. Periwinkles feed on sea-weeds, and are often collected and boiled in their shells, from which they are afterwards extracted and used for food.—Also a trailing herb of the genus *Vinca*.

Per'ry. The fermented juice of pears, prepared in the same way as cider, and used as a beverage.

Persim'mon. A tree bearing a small, rounded fruit in the United States; also in Japan. The fruit is yellow and pulpy, and when unripe is highly astringent, but is sweet and palatable after being frosted. A kind of liquor is made from persimmons.

Pet'rel. [Perhaps from the apostle Peter's walking on the sea.] A genus of sea-birds allied to the gulls. The best-known species is the stormy petrel, well known to seamen as Mother Carey's chicken. The appearance of these birds is considered to presage a storm, and they are often seen during storms at sea skimming over the surface of the water as if walking on it. Their food consists of small marine animals and seeds of sea-weeds, and they appear fond of fat or grease, for which they will follow in the wake of ships for great distances.

Petro'leum. [L., from Gk. *petra*, a rock; and *oleum*, oil.] Rock-oil, an inflammable liquid which exudes from the earth in various parts of the world. Petroleum has been known since the most ancient times, but it is only recently that its importance as a commercial production has been discovered. It is found in great quantities in the United States and at Baku, Russia, and in smaller quantities in several other countries. The oil is generally got by sinking deep holes, called wells, into the earth. In some of these wells the oil rises up and flows over, being forced out by a kind of gas; but in others the oil has to

be pumped out. In the oil-region in Pennsylvania there are now several thousand wells, some of which are more than a thousand feet deep. There is always a good deal of what is known as natural gas associated with petroleum. This gas is made up of carbon and hydrogen, and burns very brightly. It is carried in pipes to neighboring towns and used for domestic and manufacturing purposes. At one time Pittsburg used 500,000,000 cubic feet daily in its factories and houses.

The oil from the wells flows into large tanks, from which it is carried in iron pipes to the shipping places and places where it is to be refined or purified. There are more than two thousand miles of these pipes laid in the Pennsylvania oil-region, and they reach from there to Philadelphia. At the refineries the oil is distilled and separated into oil for illuminating purposes, commonly called kerosene oil; naphtha, used in making oil-cloths, and sometimes as a burning fluid; benzine, used in making paints and varnishes; gasolene, used for making gas and for mixing with coal gas. (See *Naphtha* and *Paraffin.*)

Pew′ter. [Ital. *peltro.*] A common and very useful alloy, consisting mainly of lead and tin, improved in hardness and color by the addition of a little antimony, bismuth, and zinc. Britannia metal is a kind of pewter, made of tin and antimony, with a little zinc and copper. It is harder than common pewter, has a very fine silver-looking appearance, and is largely used for making tankards, coffee-pots, tea-pots, soup-tureens, and other table dishes.

Pheas′ant. [L. *phasianus.*] The name of a family of birds, natives of Asia. The common pheasant, has been domesticated, but not successfully in this country. Some species are remarkable for their great beauty of plumage.

Phlox. A very ornamental North American genus of plants, bearing handsome flowers, of which many attractive varieties have been produced by the florist.

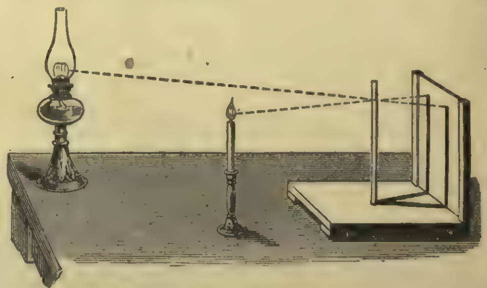
Phœ′nix. A fabulous bird of antiquity, eagle-like in form, and with gold and crimson plumage. It was said to live 500 years in the desert, then return to Egypt and build a nest. In this it was consumed, and a new bird sprang from its ashes. The word is now used in a metaphorical sense, to indicate the springing of the new from the old.

Phon′ograph. [Gk. *phone*, a sound; and *graphein*, to write.] The phonograph, invented by Mr. Edison in 1877, is an instrument which mechanically records and reproduces articulate human speech, song, etc. Speaking in front of this instrument, a thin iron plate having a blunt steel point or pen fixed at its centre is made to made to vibrate; the steel point by means of an ingenious mechanism, chronicles the vibratory movements by indenting a sheet of tin-foil, wax, or paraffin, with which it is brought into contact. The slip thus marked is then removed, and may be sent to any distance, or kept for a number of years, when it has only to be placed on a similar phonograph, and the operations reversed, in order to produce similar vibrations, which exactly reproduce the voice and the words originally spoken. The message can be read off as often as desired, until the indentations are worn out.

Phos′phate rock. A mineral, of organic origin, found in South Carolina and Florida, and to a smaller extent in other parts of the world. It is dug up and ground, and used for a fertilizer, it being rich in fertilizing properties.

Phos′phorus. [Gk. *phos*, light; and *phoros*, bringing.] A yellowish element resembling fine wax, which must be preserved under water. It is easily set on fire, and gives out a faint light in the dark. It is used for the tips of matches. It is found in the seeds of plants and in the nerves, bones, and other parts of the animal body. Phosphate of lime is abundant in bones, and from these phosphorous is now obtained.

Photog′raphy. [Gk. *phos*, light; and *graphein*, to write.] The science or art of taking representations of objects by the action of light on a prepared surface. The surface, consisting of metal, glass, paper, or other suitable substance, is prepared by being coated with collodion or gelatine, and sensitized with the chlorides, bromides, or iodides of silver, or other salts sensitive to light. The picture obtained in the camera by means of exposing one or other of these sensitive surfaces to the light cannot be seen when the plate is removed, but by pouring over it a mixture of ferrous sulphate or pyrogallic acid it comes out little by little. This is called developing the picture. Any excess of unchanged sensitive salt is then dissolved off with sodium hyposulphite or other suitable reagents, and in this way the negative image is fixed, from which any number of positive prints may be taken, which are washed, toned, fixed, and then mounted.—*Photogravure*, a print from a copper or steel plate. The picture is produced on the plate by photography, and bitten in with acid instead of engraving.—*Photo-lithograph*, a lithographic picture or copy from a stone prepared by the aid of photography.



Photom′eter. An instrument for measuring the relative intensity of light, or for comparing the intensity of two lights. The unit is the light of a candle. The incandescent electric light is measured in this way, and the glass bulbs are marked 8-12-16-32 candle power.

Phy'salia. The Portuguese man-of-war, a singular ocean animal, consisting of a pear-shaped air-sac, with a handsome crest, which floats on the surface, and from which depend a large number of long tentacles. The sac is 3 or 4 inches long, and some of its tentacles are 30 feet long.

Phy'sics. The class of sciences which include the forces or properties of matter and motion, as electricity, magnetism, light, heat, and gravitation.

Pianofor'te. A musical instrument consisting of a number of tightened wires of different lengths and thicknesses, struck with small hammers worked by keys; so called because it can produce both *soft* and *loud* tones.

Pig'eon. [Fr.] A genus of birds found in all parts of the world, there being nearly 500 different kinds. Their wings are strong, and they can fly great distances. The wild pigeon, or *passenger pigeon*, is about the size of a turtle-dove, but with a long wedge-like tail. There are numerous varieties produced by domestication, including the *fantail*, the *tumbler*, the *pouter*, etc. One of the most important of these is the *carrier pigeon*, which is capable of flying long distances at rapid speed. These birds are noted for their love of home, and they will find their way back even when taken hundreds of miles away. For this reason they have been used from the most ancient times for carrying letters, and it is from this that they get their name.

Pike. The common name of a family of well-known fresh-water fish, abundant in the temperate parts of Europe, Asia, and America. They are strong fish, rapid swimmers, and the most voracious of fresh-water fishes, living mostly on other fish. They possess a long, sharp jaw or snout, which is like a pike or spear. The common pike occurs in the rivers of Europe and North America, and is accounted exceedingly wholesome.

Pil'chard or **Sardine.** A fish resembling the herring, but smaller, thicker, and rounder, found in abundance off the coasts of Devon and Cornwall, England. Most of the pilchards landed there are salted and sent to Spain, Italy, and France. They are packed in hogsheads, each containing about 3,000 fishes, and from 12,000 to 15,000 hogsheads are annually exported.

Pile. [AS. from L. *pilum*, a pike.] A large pointed log of wood driven into the earth to support the foundations of a building, or used in engineering operations, such as making drains, bridges, and roads. Piles are driven into the ground by machines called pile-drivers, worked usually by steam. A heavy weight is raised to a considerable height between two tall posts, and then let fall on the head of the pile.

Pin. Pins were formerly made by hand, and the heads were put on separately, but solid-headed pins are now made by machines. The pin-machine, an American invention, patented in England in 1824, makes the whole pin without any help from the workman. Ordinary pins are made of wire, of the thickness required. Black pins are made by boiling brass pins in japan varnish instead of with tin.

Pine. [AS. *pin*, from L. *pinus*.] The name of a family of cone-bearing trees, found in Europe, Asia, and America, growing chiefly in mountainous or other exposed situations. Their leaves are needle-shaped, growing in clusters or in pairs, and surrounded with little scales at their base. The most important species is the American white pine, widely used in carpentry from the softness and ease of working of its timber. Other species are the red Canadian pine, the yellow pine, the nut pine, the sugar pine, and the pitch pine. Under this name are sometimes included spruces, firs, larches, and true cedars (*q. v.*).

Pine-apple. The fruit of a plant of the same name, a native of tropical America, now largely cultivated in most hot countries. The plant has many long, stiff, sharp-pointed leaves, from the middle of which grows a short stem bearing a single fruit, in shape like the cone of a *pine*. Pine-apples are sent from the West Indies and Azores to all parts of the world, and are much valued as a fruit for dessert and for preserving. A spirituous liquor called pine-apple rum is made from the juice of the pine-apple in some warm countries. The leaves of the plant contain fine fibres or threads, from which is made the beautiful pine-apple cloth. This is largely manufactured in the Philippine Islands.

Pink. [*Dianthus* = the flower of Jove, or God's own flower.] The garden pinks and carnations, so varied in form and coloring, are supposed to have descended from a single species, known in Europe as *clove pink*, a native of the southern Alps. There are now nearly 400 varieties. The roots are annual or perennial, the stems herbaceous and jointed, bearing a pair of opposite, linear, apparently veinless leaves at each joint. The flowers have peculiar grace and fragrance. The carnation and picotee are modifications of the clove pink.

Pin'nace. [Fr., from L. *pinus*, a pine tree.] A small ship, having sails and oars, used as a tender to a larger vessel, and chiefly employed to obtain intelligence and to land men; also a man-of-war's boat.

Pipe. [AS.] A tube made of various materials—as earthenware, wood, metal, leather, gutta-percha, etc.—for the conveyance of water, steam, gas, or other fluid; used for a great variety of purposes in the arts and in domestic economy. Tobacco-pipes, used in smoking tobacco, usually take the form of a bowl and connecting tube, and are made of baked clay, porcelain, stone, meerschaum, wood, and various metals. Meerschaum pipes are beautifully carved. Pipe-stems are made of cane, and of cherry, elder, jasmine, and other woods; mouth-pieces are usually of bone, amber, ivory, and sometimes of silver. (See *Meerschaum*.)

Pis'tol. [Fr., from Ital. *Pistola*, a town in Italy, now *Pistoja*.] A small fire-arm that can be held in one hand while being fired; said to have been first made at Pistoja. (See *Revolver*.)

Pis'ton. [Fr., from L. *pistus*, *pinsere*, to beat. Same root as *pestle*.] A solid piece of metal or other material, in the form of a short cylinder, attached to a rod called the *piston-rod*, which in its turn is attached to the adjoining machinery. It is made to fit exactly the cavity of a pump, tube, or other cylindrical space, in which it works up and down alternately, and is employed in forcing some gas or liquid into or out of the tube which it fills, as in steam-engines, fire-engines, and pumps (*q.v.*).

Pitch. [L. *pix*.] A thick, black, sticky substance got by boiling down tar, used for coating ropes, canvas, etc., and by ship-builders for filling up the seams and coating the outsides of ships and boats.

Plaice. (L. *Platessa*.) A common flat fish, somewhat like a flounder. The sides of the body are more compressed than in other fishes. It is caught in large quantities in European waters as a food fish.

Plane-tree. [Fr., from L. *platanus*.] A tall spreading tree, with broad leaves shaped like an open hand, and seeds united in little globular pendent balls. The best-known species are the Oriental or Asiatic plane-tree, and the Occidental or American, which is also called the buttonwood and sycamore. It grows almost all over the United States east of the Rocky Mountains. It is occasionally more than 100 feet high and from 12 to 15 feet thick, and makes an excellent shade tree. Its wood is hard and close-grained, and largely used for joiners' work.

Plant. [AS., from L. *planta*, a plant.] An organized living thing, generally without feeling or voluntary motion, with a root, stem, and leaves, though consisting sometimes only of a single leafy expansion. Plants grow in a great variety of forms, such as trees, shrubs, herbs, grasses, ferns, mosses, lichens, etc. Trees and shrubs are called perennials, because they live on through many years. Herbs are divided into annuals, biennials, and perennials. All parts of a plant—root, stem, leaves, flowers, and fruit—are made up of cells of different kinds, and by means of these the plant lives and grows. The food of plants is partly gaseous and partly liquid. The gaseous food is carbonic acid, which they get chiefly from the air, and take in principally by their leaves. The liquid food is water, which they take up mostly through their roots. Most plants grow from seeds, and although all do not bear true flowers and real seeds, they all have something which answers for seeds. Thus we have flowering plants and flowerless plants. The former class includes almost all trees, shrubs, and herbs; while ferns, mosses, sea-weeds, lichens, and fungi constitute the latter. Flowering plants are divided into two classes, which differ from each other in stems, leaves, and seeds. These classes are further divided into orders or families, each of which is named after some chief plant of its order—as the Oak family, the Pine family, the Rose family, etc.

Plan'tain. [Sp. *plantano*.] A plant or tree and its fruit, of the genus *Musa*, found in the countries of the torrid zone. The plantain attains a height of from 15 to 20 feet, with leaves often more than 6 feet long and nearly 2 feet broad. Its fruit is extensively used as food. (See *Banana*.)

Plas'ter. [L. *emplastrum*, with *em* dropped.] A mixture of lime, sand, and water, employed in overlaying the interior and exterior faces of walls. *Plaster of Paris*, sulphate of lime—a powder extensively employed in making casts of statuary.

Plate-glass. A fine kind of glass (*q. v.*), cast in plates, used for looking-glasses, etc.

Plat'inum. [Span., from *plata*, silver.] A comparatively rare metal, found only in the native state, commonly in grains, scales, or nuggets, and generally alloyed with five other metals—namely, palladium, rhodium, iridium, osmium, and ruthenium. It is obtained chiefly from the Ural Mountains, and in smaller quantities in Brazil, California, Ceylon, and Borneo. Platinum possesses a dull white color, and does not tarnish under any circumstances in the air. It is heavier than gold, as soft as copper, and may be hammered into thin plates and drawn out into fine wire. It is very infusible, and can only be melted by the heat of the oxy-hydrogen blowpipe. It is used for electrical and chemical apparatus, and since the introduction of platinotype processes in photography the metal has very much increased in price.

Plov'er. [Fr., the rain-bird; from L. *pluvia*, rain.] A genus of wading birds, which are found in every quarter of the globe. Many of them are birds of passage, and they are prized as game birds. Among the more important species are the black-breasted plover and the golden plover of Europe and America, the ringed plover, Wilson's plover, the stilt plover, and the lapwing. (See *Lapwing*.)

Plum. [AS., from L. *prunus*.] The name given to a tree or shrub and its fruit. It belongs to the genus *Prunus*, of which there are several species. From 200 to 300 varieties of plums are derived from the *Prunus domestica* species. Among the best known are the *green gage*, the *Orleans*, the *damson*, the *purple gage*, and the *German prune*. Plums are much used for dessert, and are made into preserves and prunes.

Plumb. [L. *plumbum*, lead.] A little weight of lead attached to a line, and used by builders, etc., to indicate a vertical direction. *Plumb-line*, the cord by which a plumb-bob is suspended.

Plumba'go. [L. *plumbum*, lead.] Native carbon in hexagonal crystals, of black color and metallic lustre, and so soft as to leave a trace on paper. It is used for pencils, for crucibles, and as a lubricator.

Plum'met. A piece of lead attached to a line, used in sounding the depth of water. *Plummet-line*, a line with a plummet.

Plush. [Fr., from L. *pilus*, hair.] A kind of cloth with a nap or shag on one side, longer and softer than the nap of velvet.

Poin'ter. A breed of hunting dogs which, when they scent game, stop and stand motionless until

the hunter is near enough to shoot. Then, at the word, the dog darts forward and springs the game.

Poi′son. [Fr., from L. *potio*, a drink.] Any substance or matter which, when introduced into the body in any way, can destroy life by its own inherent qualities without acting mechanically. *Poison* usually denotes something received into the system by the mouth, breath, etc. *Venom* is something discharged from animals and received by means of a wound, as by the bite or sting of serpents, scorpions, etc.

Pole′cat. An animal of the Weasel tribe that is highly destructive to poultry. It possesses glands which secrete a fluid of a very offensive odor. This it gives off when pursued, thus checking dog or man until the animal can escape.

POTTERY

It occurs in all parts of Europe. The weasels generally emit a fetid secretion, much the worst examples being those of the polecat and the frightfully offensive skunk (*q. v.*).

Polo. A game of ball resembling hockey, the players being on horseback. It is of Eastern origin, and the name properly signifies the ball used in the game.

Pomade′ or **Poma′tum.** [Fr., from L. *pomum*, an apple; pomade being formerly made by boiling apples in fat.] Ointment made of some fine inodorous fat, such as lard or suet, and used instead of liquid oil for dressing the hair. It is perfumed by the addition of fragrant essences or essential oils.

Pomegran′ate. [Fr., from L. *pomum;* and *granatus*, grained, having many grains or seeds.] A tropical shrub or small tree and its fruit, which is red, as large as an orange, and has a thick, leathery skin containing a juicy, pleasant-flavored pulp and numerous seeds. The pulp and the seeds are the parts eaten. The rind of the fruit and the bark of the root are used for tanning the finest morocco leather, and also in medicine.

Pop′lar. [Fr., from L. *populus*, a poplar.] A tall tree of the same family as the willow, of rapid growth, and having soft wood, capable of many uses. About twenty species are known, growing chiefly in mild and cold climates. The most important are the gray poplar, a native of Britain; the Lombardy poplar, of a conical form and without horizontal branches; the balsam poplar, the buds of which are covered with a sticky varnish called balsam; the Canadian poplar, and the cottonwood, a valuable timber tree, which is very abundant on the upper sections of the Mississippi and the Missouri valleys.

Pop′py. [AS. *popig*.] A herbaceous plant belonging to the genus *Papaver*, and bearing large, showy, but short-lived flowers. The most important species is that known as the opium or oil-poppy. It is extensively cultivated in warm climates for its milky juice, which when condensed forms the opium of commerce, and also for the bland fixed oil obtained from the seeds. *Poppy oil* is as sweet as olive oil, and is employed for culinary purposes. (See *Opium*.)

Por′celain. [Fr., from Ital. *porcellana*, the porcelain or Venus shell: L. *porcus*, a pig.] A fine kind of earthenware, first made in China and Japan; so called from its likeness in color to the Venus shell, which was thought to resemble in shape the back of a young pig. It is now made in Europe and America. It is also called *china* or *chinaware*. Some of the French and English porcelain, especially that made at Sèvres and Worcester, is extremely white and translucent, but is more apt to crack by sudden changes of temperature, and is more brittle, than the finest porcelains of China and Japan. (See *Pottery*.)

Por′cupine. [Fr., from L. *porcus*, a hog; and *spina*, a thorn.] A nocturnal rodent quadruped, about two feet long, having on the head and neck a crest of long hairs, very short hair on the legs and muzzle, and the other parts covered with spines or quills, some a foot long, which, when excited, the animal raises almost at right angles with the body. Porcupines generally inhabit warm or tropical regions. The common or crested of southern Europe and northern Africa, and the Canadian or North American, are the best-known species.

Por′phyry. [Fr., from Gk. *porphyrites: porphyra*, purple.] A hard, finely-grained stone or rock, having a compact felspathic base, through which are scattered distinct crystals of one or more

minerals. Porphyry may be green, with blotches of paler green or white; or red, with white blotches or specks; and has other shades of color. The blotches of a polished surface are the felspar crystals. The rock abounds in Egypt, in the northern parts of Europe, in South America, and in Mexico. All the varieties are esteemed as marbles, and used in fine sculpture-work.

THE POPPY PLANT.

Por′poise. [Fr., from L. *porcus*, a hog; and *piscis*, fish.] This animal belongs to the same genus as whales, and is the smallest and most familiar of the cetacean mammalia. It is from 4 to 6 feet in length, of a dusky or blackish color on the back, and white beneath. It is closely allied to the dolphins, but has a shorter snout. When swimming, its round back looks like a hog in water. Porpoises swim in shoals, and drive herrings, mackerel, and salmon before them. They seek for prey near the surface, but also descend to the bottom in search of sand-eels and sea-worms, which they root out of the sand with their noses, as hogs do in the field for their food. From their blubber or flesh a fine oil is made, and from their skins leather for the uppers of boots and shoes.

Pot′ash. [*Pot*, and *ashes*, prepared by evaporating in iron pots the lixivium of the ashes of wood.] An alkali much used in the arts. It is an oxide of potassium, though the potash of commerce, usually called crude potash, is properly potassium carbonate, because it contains carbon as well as potassium and oxygen.

Potas′sium. A metal of a bright silver-white color, derived in 1807 by Sir Humphrey Davy from potash. It is prepared by heating together potash and carbon to a high temperature in an iron retort. It is lighter than water, brittle at 32° Fahrenheit, malleable at a little higher temperature, melts at 62°, and when heated to a temperature below red heat it yields a fine green-colored vapor. It has a strong affinity for oxygen, taking fire when thrown upon water or ice, and oxidizes so readily that to be preserved it must be kept in substances which contain no oxygen, as naphtha or kerosene. Its compounds are very important, being used in glass and soap making, in artificial manures, and in many drugs and chemicals. The most important of the salts of potassium are potash, nitre or saltpetre, chlorate of potash, and cream of tartar.

Pota′to. [Span. *patata*, potato, from the native American word (probably *batata*) in Hayti.] Next to the cereals or grains, the potato is the most valuable of all plants used for food. It is a native of South America, and was introduced into Great Britain by Sir Walter Raleigh in the sixteenth century. The potato plant has a portion of its stem underground, and this part sends out roots and real branches. It is at the ends of these branches that potatoes are formed. Every part of the potato plant except the tuber dies off on the approach of winter, and the tuber is the special provision made by the plant for reproduction. The eyes of the potato are real buds, and the solid flesh of the tuber consists mainly of starch, the destined food of the young plant. Potatoes are largely cultivated in all mild climates. There are very many varieties, differing in time of ripening, form, size, color, and quality. New varieties are raised from the seed, but potatoes are grown by planting the tubers or cuttings of them, care being taken to have at least one eye in each piece. About three-fourths of the weight of a full-grown potato is water, and of the other fourth about one-sixth is gluten and five-sixths starch.

Pot′tery. [Fr. *poterie*.] The term applied to all objects made out of baked clay. The art of forming utensils of clay is of very ancient origin, extending back to the early days of mankind. Its rudimentary condition, that of merely molding soft clay into the desired form and drying it by the heat of the sun, was succeeded by baking it in a fire to make it harder and less brittle. Other substances were afterwards mixed with the clay so as to make finer and more delicate pottery. Gradually the potter enhanced the value of the art by forming graceful designs, and by painting and decorating them, until at the present day the art of the potter is one of the most important. Pottery may be divided as regards material and baking into three kinds—earthenware, stoneware, and porcelain or china. The term *pottery* is applied to all ware of the opaque kind, while *porcelain* applies to that which is translucent.

Prai′rie. [Fr., from Low L. *prataria*; L. *pratum*, a meadow.] A large level tract of country, bare of trees, covered with coarse grass, and generally of a fertile soil. This name is applied to the treeless plains of the Mississippi valley. Similar plains in the South are called Savannahs.

Prai′rie-dog. A small rodent animal, allied to the marmot, and found in the prairies west of the Mississippi. It is gregarious in habit, dwells in largely arid districts, makes deep burrows in the earth, and throws up mounds. On these the animal often sits, and, if disturbed, gives a warning cry somewhat like the bark of a small dog.

Precious stones. Minerals which are used in jewelry on account of their rarity and beauty. They include the diamond, ruby, emerald, sapphire, and many others.

Prim′rose. [Old Fr. *primerole*, from L. *primula;* corrupted in spelling as if from L. *prima rosa.*] A beautiful early-flowering plant, closely allied to the cowslip, common in meadows and on the banks of streams of England. The *evening primrose* is a biennial herb from 3 to 6 feet high, resplendent with yellow flowers which open at sundown, common in upland meadows, along fence-rows, and in sunny wastes.

Print′ing. The art of producing impressions on paper. It is divided into the printing of books and newspapers from movable type, and from stereotype or electrotype plates. Printing was known to the Chinese as early as the sixth century, but their system was that of printing from engraved blocks. The invention of movable types is claimed by the Dutch in favor of Coster, 1420; and by the Germans on behalf of Gutenberg, 1440. Printing was introduced into England by Caxton in 1477. Wooden types were first used, but those made of type metal are now general. The first apparatus used for taking the impressions from types and blocks was in the form of a screw-press. This rude contrivance was soon replaced by a wooden lever-press, which in turn gave way to the hand-press made of iron, and this to the steam-press. Books are printed either on single-cylinder machines, which print one side of a sheet of paper by passing it over a form of type or plates, or on double-cylinder or perfecting machines, which print both sides of the sheet while it passes through the machine. In both cases ink (*q. v.*) is supplied by a self-inking apparatus, consisting of slabs and several soft composition rollers. Newspapers and periodicals are printed on rotary or web-printing machines, which take an impression from curved stereotype plates fixed on a rotating cylinder, the paper being run into the machine from huge reels. These machines produce from 12,000 to 24,000 printed sheets per hour. The Walter press, the Victory, the Hoe, and the Marinoni are most in use, and usually have folding-machines attached, which deliver the sheets folded. For some periodicals, not only the body of the magazine but the cover is printed on the same machine, and the magazine folded and inserted inside the cover.

Prism. [Gk. *prisma*, something sawn off; *prizein* = *priein*, to saw.] A piece of wood,

REFRACTION, THROUGH A PRISM.

metal, glass, etc., the ends of which are parallel, and equal in size and shape, and the sides parallelograms. Prisms of different forms are often named from the figure of their bases, as triangular, hexagonal, etc.—In optics, a three-sided piece of glass with two equal and parallel triangular ends, used for separating the colors in a ray of light, and in refraction, etc. (See *Spectrum.*)

Pri′vet. [From *primet*, perhaps from *prim*, because cut and trimmed.] An ornamental European shrub, much used in hedges. (*Ligustrum.*)

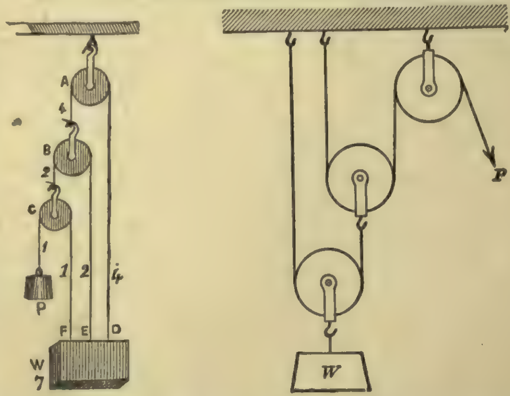
Propel′ler. A contrivance for propelling a steamship, usually consisting of a screw placed in the stern, and made to revolve under the water by an engine.

Prune. [Fr., from L. *prunum*, a plum.] A dried plum, much used in cookery. The best prunes come from France, where several kinds of plums are raised for making prunes. Great quantities are also exported from Bosnia and Servia.

Ptar′migan. The white grouse, a bird found in northern Europe and America. Its color in summer is a pale-brown or ash, with wings and under-plumage white. In winter its plumage changes in color to a pure white.

Puf′fin. An arctic sea-bird allied to the auks, so called from its short, thick, swollen beak and rounded belly. It is also known by the names of *bottle-nose*, *cockandy*, *coulterneb*, *mormon*, *pope*, and *sea-parrot.*

Pul′ley. [Fr., from *pull*, or from Low L. *pullanus*, a colt.] One of the mechanical powers, consisting of a wheel called the *sheave*, movable about



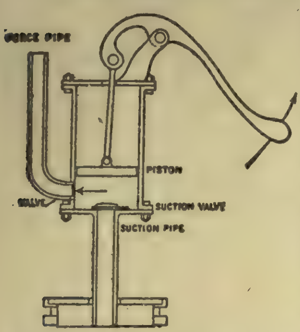
an axis, and having a groove cut in its circumference, over which a cord or rope passes. The rope is attached at one end to a fixed point, and the force acting on the free end of the rope is doubled, but the load is only moved through half the space traversed by the rope. Pulleys are used either singly to change the direction of the power applied, or in various forms of combination to raise heavy weights.

Puma. (See *Cougar.*)

Pum′ice. A porous mineral thrown out from volcanoes. It is a spongy lava, so light that it will float on water. It is powdered and used as a polishing material.

Pump. A hydraulic machine, variously constructed, for raising water and other liquids. The common or suction pump is constructed as follows:—The lower end of a long, narrow, vertical pipe, called the *suction-pipe*, is immersed in a

well or reservoir of water, and the upper end communicates with a wider pipe, called the *barrel*, which has a lid on the top and a spout on one side near the top. The barrel contains two valves, both opening upwards, —the lower one, between the suction-pipe and the barrel, called the *suction-valve;* and the upper one, called the *piston valve*, affixed to the upper surface of a movable piston, connected by a rod with the handle of the pump. On working the pump the air below the piston is exhausted, and water is forced into the vacuum and through the lower valve by atmospheric pressure. On the descent of the piston the water above the lower valve, closing that valve by its weight, passes through the piston, and is then lifted to the level of the discharging tube or spout. (See *Air-pump* and *Force-pump.*)



Pump′kin. The fruit of a plant allied to the squash, and belonging to the gourd family. The plant is a running vine, the fruit a large oblong globe, of orange color when ripe, and sometimes of immense size. It is used for feeding cattle, and as a food; either boiled, or made into a pie with other ingredients.

Purse. [Fr., from Low L. *bursa*, a purse: Gk. *byrsa*, a hide.] A small bag for money, generally made of skin or leather; a small bag or pouch, the opening of which is made to draw together closely.

Put′ty. [Fr., from *potee*, from *pot*, pot; what was formerly called *putty* being a substance resembling what is now called *putty powder*, and in part made of the metal of old pots.] A mixture of whiting or soft carbonate of lime and linseed oil, beaten to the consistence of dough, and used in fastening glass in sashes, and for filling up crevices, etc. *Putty powder* is an oxide of tin, or of tin and lead in various proportions, used in polishing glass, metals, and precious stones.

Pyr′amid. A solid body whose base is a square, triangle, or polygon, and its sides plane triangles, meeting at top in one common point. Architecturally, it applies to the great mounds of stone or brickwork found in Egypt, and in some other countries. The largest of the pyramids is that built by Cheops, on the plain of the Nile. This has a square base, each side of which measures 763.4 feet, while its height is 480 feet. The pyramids contain sepulchral chambers, in which the bodies of the Pharaohs were buried.

Pyrometer. [Gk. *pyr*, fire; and *metron*, a measure.] An instrument for measuring heat too high in temperature to be measured by common thermometers, as the heat of furnaces.

Pyx. [Gk. *pyxis*, a box; *pyzos*, box-wood.] The sacred box in the Roman Catholic Church in which the host is preserved; the box at the Mint which holds the sample coins that have been tested for the weight and fineness of the metal; the box in which the compass is suspended.

Q

Quad′rant. [L. *quadrans*, a fourth part.] An instrument used in astronomy, navigation, surveying, and gunnery, for measuring altitudes and determining angular measurements. It generally consists of a brass limb, the quarter of the circumference of a circle, mounted on a frame and marked with degrees, minutes, etc., and having a plumb-line or spirit-level for fixing the vertical or horizontal direction.

Quag′ga. An animal of the Horse tribe, found in southern Africa. It strongly resembles the zebra, though of smaller size. It is social in habit, lives in large troops, and is more easily tamed than the zebra. It is said to have been largely or wholly exterminated by hunters.

Quail. [Fr., from Low L. *quaquila;* from Old Du. root of *quack*, because of its cry.] A bird of passage, the smallest of the Partridge family, common in the south of Europe, and in Asia, Africa and North America. Quails live in flocks, feed chiefly on insects, slugs, grains, and seeds, and are noted for taking long and fatiguing journeys. Immense flocks visit the countries along the Mediterranean, and large numbers are caught for food. The flesh is more juicy and delicate than that of the partridge.

Quar′rantine. [Fr. *quarante*, forty; L. *quadraginta*.] The space of time, formerly forty days, but now variable in length, during which a ship suspected of having infectious disease on board is obliged to forbear all intercourse with the shore.

Quart. [L. *quartus*, fourth.] A measure of capacity, in dry and in liquid measure, equal to two pints, or the fourth part of a gallon. The English quart contains 69.32 cubic inches; the United States dry quart contains 67.20 cubic inches, the fluid quart 57.75.

Quartz [Ger. *quarz*.] The common name of silicon oxide or silica, the most abundant of all minerals, being one of the constituents of granite, gneiss, mica slate, etc. It forms quartz rock and sandstone, and makes most of the sand of the seashore. It occurs massive, crystallized, granular, and in other forms. The primary form of the crystal is a rhomboid; but it is generally met with in hexagonal prisms, terminated by hexagonal pyramids. When crystallized and pure, it is called *rock-crystal*, and is transparent and colorless. Quartz is so hard that it will scratch glass and strike fire against steel. It comprises numerous varieties, many of which

are colored by different substances—as purple quartz, or amethyst, rose quartz, yellow quartz, chalcedony, agate, carnelian, bloodstone, jaspar,

THE QUAIL.

sard, onyx, cat's-eye, etc. Quartz is used in the manufacture of glass, and of porcelain and other kinds of pottery; also as a flux in the smelting of several kinds of ores. Gold often occurs in quartz veins, and quartz-crushing machines are used to extract the gold ore.

Quas′sia. [Named from a negro, *Quassy*, who first made known the medicinal virtues of one of the species.] A genus of tree belonging to the tropical parts of South America. The wood of the root is intensely bitter, and is used in medicine, and sometimes as a substitute for hops in making beer.

Quay. [Fr. *quai.*] A bank or wharf constructed toward the sea or at the side of a harbor, river, or other navigable water, for convenience in loading and unloading vessels.

Quick′lime. A white, caustic, infusible powder, obtained in a state of purity by heating pure carbonate of lime to full redness; so called because when wet it develops great heat. The quicklime of commerce is obtained by calcining in kilns any carbonate of lime, as limestone, marble, chalk, etc. Mixed with sand and water it forms lime. (See *Lime.*)

Quick′silver. [*Quick* and *silver.*] Mercury; so named for the great mobility of its globules, and its resemblance in color to silver. (See *Mercury.*)

Quilt. [L. *culcita*, a bed, a cushion.] A cover or coverlet made by stitching one cloth over another, with some soft substance, such as wool, cotton, etc., between them.

Quince. [Fr. *coing*, from L. *cydonius*, a quince tree; so called from the town of Cydonia, in Crete, which was noted for its quinces.] The fruit of a shrub which grows in mild climates, and belongs to the same family as the apple. The fruit is usually pear-shaped, but some quinces look more like an apple. Quinces possess a hard flesh of high flavor, but very acid, and though not good to eat raw, they are largely used for marmalade, jelly, and preserves.

Quin′ine. [Fr.] An alkaloid obtained from the bark of different species of cinchona trees, originally known in Peru, but now transplanted to Java and India. It has a bitter taste, and forms the base of certain salts used in medicine. —*Sulphate of Quinine*, a salt crystallizing in snow-white, light, efflorescent needles. It is not very soluble in water, but dissolves easily when a drop or two of sulphuric acid is added, and is extensively used in medicine as a tonic and febrifuge.

Quire. [Fr. *cahier*, a book of loose sheets.] Twenty-four sheets of paper of the same size and quality, unfolded or having a single fold; one-twentieth part of a ream.

R

Rab′bit. A small rodent quadruped of the Hare family, living chiefly in large colonies called warrens, in burrows dug deep into the ground. They are not much seen during the day, but come out at night to eat, and they often do great damage by gnawing the bark off young trees and by spoiling growing crops. Rabbits are remarkably prolific, and have become pests in some parts of Australia and New Zealand. The common European species, which is often kept as a pet, has been introduced into many countries.

Raccoon′. [Fr. *raton*, a little rat.] A carnivorous animal of the Bear family inhabiting North America. Its body is gray, varied with black and white. The average length of the raccoon is about two feet from the nose to the tail, and the tail is about ten inches long. The head somewhat resembles that of the fox. It feeds chiefly by night, keeping in its hole during the day, except in dull weather. One of the marked peculiarities of the common species, *Procyon lotor*, and on which its specific name (*lotor*, from L. *lavare*, to wash) is founded, is its habit of plunging its dry food into water before eating it. Its fur is valuable, particularly in the manufacture of hats.

Rad′ish. [Fr., from L. *radix*, a root.] A garden plant, cultivated for its pungent fleshy root, which is eaten raw for salad.

Raft. [Scand.] A float consisting of logs, boards, or other pieces of timber fastened together, either to serve as a support in conveying other things, or for their own collective conveyance on the water.

Rail. [Fr. *raler*, to rattle in the throat.] Numerous species of birds prized as game birds. The common European *land-rail* is usually known as the corncrake. It has a grating cry, familiar in summer. The *water-rail* has a longer bill and darker plumage, and loves the

wet marshes. It is found in Iceland, North Africa, and China. American species are the clapper-rail or marsh-hen, the king or red-breasted rail, the Virginia rail, and the Carolina rail or ortolan. The flesh of all these birds is delicate, and the Virginia rail is a favorite game bird.

Rail′way or **Rail′road.** A road or way of parallel iron or steel rails on which the wheels of carriages run, and supported on a bed or structure. *Railway* is the usual word in England, but *railroad* is common in the United States. The modern railroad is an adaptation of the old horse tram-roads, with cast-iron flange rails, used for hauling coals early in the century. The Stockton and Darlington Railway, the first line with locomotives, was opened in October, 1825. The first passenger line in the United States was the Baltimore and Ohio, opened in 1830. There are now over 190,000 miles of railroad in the United States, 160,000 in Europe, and about 450,000 in the world. Rails are now usually laid to the standard width or gauge of 4 feet 8½ inches. The iron rail, formerly wholly in use, has been widely replaced by steel. The steam locomotive known as the *Rocket*, invented by Robert Stephenson in 1829, weighed 8 or 9 tons; locomotive engines now weigh from 35 to 50 tons, and draw a train averaging from 400 to 500 tons. In 1838, on the London and Birmingham line, a speed of 20 miles an hour was obtained. Now a speed of 50 miles an hour, including stoppages, is maintained on one of the New York Central trains between New York and Chicago for a distance of nearly 1,000 miles, and 60 miles an hour is made on some roads for shorter distances. A straight and horizontal surface being the standard of perfection for railroad-making, sharp curves and steep gradients are regarded as evils. Routes are therefore shortened by embankments, cuttings, tunnels, and bridges. Among the remarkable railway tunnels are the St. Gothard and Mont Cenis in Switzerland, and the Hoosac Tunnel in Massachusetts. Of railway bridges the most wonderful are the Forth Bridge, Victoria Bridge (Montreal), Britannia (Menai Strait); also those at St. Louis, Rock Island, Louisville, and Niagara. Cars such as Pullman cars, with entrance at each end, are common in the United States and Switzerland; those entering at the sides are usual in Britain and other parts of Europe.

Rain. [AS. *regen.*] Water falling from the clouds in drops. This is the chief source of water-supply. By the heat of the sun water is evaporated from the surfaces of the seas and oceans and transported as water-vapor by winds. When it is condensed by cold, chiefly caused by the heated air rising into higher regions, it returns again to the liquid state, and falls down as drops of water in rain; or, if the cold be very great, the water may pass at once into the solid state, and fall as snow or as hail. *Rain-water* is very soft, and in country places it is pure; the air of large towns being full of impurities, the rain brings them down with it as it falls, and so purifies the air by washing it. In Britain the prevailing winds are westerly, and, being charged with moisture from the Atlantic, much rain falls on the western coasts, and pasture is abundant. In the eastern part of the United States, where there are no great mountains to catch the moisture, the rainfall is uniform; but in the west and north the rainfall is determined by a centre of low atmospheric pressure in the Rocky Mountains. The heaviest rains occur in the tropics, and are confined to one part of the year called the *rainy season.* At a point 100 miles north of Calcutta the annual rainfall is from 500 to 600 inches. In Burmah the rainfall is 200 inches.

Rain′bow. [AS.] A bow or arch in the sky opposite to the sun in time of rain, caused by the rays of light breaking up into their seven separate colors as they fall on the rain-drops. (See *Prism*, *Spectrum*, *Light.*) Rainbows sometimes occur on the spray rising from waterfalls. Most rainbows are seen in the afternoon, when the sun is in the west, and sometimes in the morning, but never at noon, because then the sun is above us, and we cannot stand between it and the rain. When there is a double rainbow the inner is the primary, and the outer the faint or secondary one.

Rai′sin. [Fr., from L. *racemus.*] A ripe grape dried in the sun or by artificial heat. (See *Grape.*) Raisins are dried either with the stalk cut nearly into two and left to dry on the vines, or with the branch wholly cut off, hung up, or laid on floors to dry. The first are best, and are called the muscatels or raisins of the sun, and the finest come from Malaga and Valencia in Spain. Sultanas are made from a grape without seeds, and are brought from Smyrna.

Ram′ie. The fibres from the bark of the ramie plant, a native of India, now grown in the United States. The fibre is strong and lustrous, but the difficulty of separating it from the bark has proved a check to its use. The plant is a tall herb, sending up long shoots after each cutting.

Rape. [L. *rapa.*] A root plant with a leaf like that of a swede turnip and a stem resembling that of a cabbage. It is sown in rows and hoed out like turnips. The plant grows rapidly, and its roots penetrate deeply into peaty soils and clays. The seeds are useful for cage-birds, and from rape-seed rape-oil is produced.

Rasp′berry. A kind of shrub with a thimble-shaped fruit, dark-red, large grained, and covered with a thick bloom. Like the strawberry it belongs to the Rose family; but, unlike the blackberry of the same family, the rasp separates readily from the core or receptacle. It has a perennial root, producing biennial woody stems or canes reaching to from 3 to 6 feet in height. Usually the canes do not bear till the second year, and that ends their life, their place being taken by a new growth from the root. The wild raspberry is called the bramble. Raspberries are used for jams, jellies, and wine beverages.

Rat. [AS. *ræt.*] A gnawing or rodent animal like the mouse, but larger and more destructive. It has sharp chisel-shaped teeth, with which it gnaws holes through wood-work, and with its claws it burrows under floors. It can climb trees, and descend headforemost by means of its claws, which are hooked, and turn inward or outward. Rats are not easily caught, because they are so cunning and have so keen a scent that they will not go near a trap set by a person with bare hands. They eat both animal and vegetable food, and are found in fields, in woods, in the water, in houses, in barns, and in sewers. They cross the sea in ships, and have followed man over the world. They are a pest to the farmer, and destroy grain, steal eggs, and kill young poultry of the farm-yard. The rat increases in swarms, often alarmingly. But the cat, the dog, the ferret, the weasel, the hawk, and the owl all prey upon rats and keep down their numbers. They are fierce and dangerous and bite viciously. The common brown rat, or Norway rat, is about 10 inches long, and has a tail of about 8 inches, a pointed nose, and whiskers like a cat. Its fur is light brown above and dirty white beneath, and its feet are flesh-colored. The black rat is smaller and weaker. Water-rats are almost as large as brown rats, but are harmless, feeding on vegetable food, and making their holes in the banks of rivers, ditches, and ponds. Gloves are often made of rat-skin, and the fur is used for covering hats. In China the flesh of the rat is regarded as a delicacy. The squirrel-tailed wood-rat of the Rocky Mountains builds a great nest of sticks and brush in a tree or clump of shrubs.

Rat′chet-wheel. A toothed circular wheel acted on by a bar or catch. The wheel moves forward by a reciprocating lever, and cannot be reversed until a ratchet or click for preventing backward motion is removed or lifted.

Rattan′. The long, slender stem of a species of

RATTLESNAKE.

calamus and other allied species of palms, which are among the most useful plants of Malaysia. These stems are largely used for cane-work, and also for making walking-sticks.

Rat′tlesnake. [O.E.] A poisonous snake of America, with horny interlocking joints at the end of its tail with which it makes a rattling sound before striking its prey. The rattle is composed of a number of horny, button-like rings which fit loosely into one another and make a rustling noise when shaken rapidly. Some think that one new rattle is added with each shedding of its skin. The poisonous fangs take the place of other teeth in the upper jaw. These fangs are a pair of large teeth punctured by a tube from the poison-gland. They are laid back when not in use, but when the snake strikes its prey the fangs spring forward and the poison flows from the poison-gland. Its bite is very poisonous, and it is very much dreaded. The best known are the diamond rattlesnake of South America and the common rattlesnake of North America.

Ra′ven. [AS. *hræfen.*] (*Corvus corax.*) A bird like the crow, but larger, with a croaking voice and thievish habits as regards trinkets and food. It was once plentiful in England, but is now rare. Its color, though apparently black, is a deep blue. Its wings are long and slightly rounded, and its flight steady and rapid. It has a sedate walk, and when carrying off food has a curious hop, and makes use of its wings at the same time. It is wary, but is easily tamed and very sagacious. The raven is found in most parts of the globe, and ranges as far north as Melville Island, it being one of the few birds that brave the cold of an Arctic winter.

Ray. [Fr.] A flat kind of fish with ray-like fins on its breast. It has eyes on the upper surface, which is the back of the animal, and not the side, as in ordinary flat-fishes. The mouth is large, and the jaws are covered with numerous rows of small pointed teeth. The skin is usually beset with spines, in many cases resembling true teeth in structure, and sometimes quite formidable weapons. Its eggs are enclosed in brown leathery four-sided cases like those of the shark or dog-fish, and with long processes at the angles. True rays have the snout more or less pointed, the tail slender, and two small dorsal fins. The Ray family includes the skate and thornback. Sting rays have long, tooth-like spines, which are often used by savages to form barbed spear and arrow heads. The sting ray is common in the Mediterranean. Eagle rays, or white rays, have great pectoral fins, which resemble wings, and their tails are like whips. Sharp-nosed rays are favorites of the French, who eat them instead of skate. Electric rays are sometimes called torpedo fishes.

Ra′zor-bill or **Common Auk.** A sea-bird allied to the great auk, which is now extinct. It has wings large in proportion to its size. It is 17 or 18 inches long, and its wing is 7 or 8 inches, and when extended the wings are 27 inches wide. It has a glossy black head, a dark-brown throat, a white breast, and lower body of white. Its bill is strong and hooked. It lays one large egg of a greenish color. This bird abounds in the Arctic seas, migrating southward in the cold season.

Ra′zor-fish. A long, slender, and brittle mollusc that abounds on all sandy shores. The shell has delicate tints of rose and violet, covered by a brown epidermis. By means of its muscular foot it digs a deep hole, which it does not leave, but raises itself to the entrance of the hole. It is timid and difficult to catch.

Ream. [Fr., from Arab, *rizmat*, bundle.] A quantity of paper, consisting of 20 quires or 480 sheets. A common practice now is to count 500 sheets to the ream.

Reau′mur. A thermometer with zero as the melting-point of ice, and 80° the boiling-point of water. Four degrees of Reaumur are equal to 5 degrees Centigrade and 9 degrees Fahrenheit. The Reaumur thermometer is in general use in Spain and Germany.

Reed. [AS.] A thick, coarse grass, with hollow, jointed stalks, growing in or near water. The *common reed* grows in Europe and North America. The bamboo is a useful reed. The papyrus is often called the *Egyptian reed.*—A slip of cane in the mouth-piece of a musical instrument, and set in vibration by the breath. In the harmonium, melodeon, and accordeon the reed is a thin piece of metal which by vibration produces the tones of the instrument.

Reef. [Du. *rif*, a rift.] A line of rocks lying at or near the surface of the water. Any large vein of auriferous quartz or rock yielding ore is called a reef.

Reflec′tion. The effect produced upon light by a smooth surface. Part of the light enters the body, part is thrown back or reflected at an angle opposite to that made by the incident ray. This is the principle of the mirror, the body whose light is reflected seeming to lie behind the mirror, in the direction of the reflected ray.

Refrac′tion. When a ray of light passes from space through the air, or from air through water, glass, or other transparent, it is bent from its original course more towards the line leading to the earth's centre. This bending is known as refraction, and is the source of various important phenomena of optics.

Rein′deer. [Scand. from Lappish.] A kind of deer with branching horns found in the extreme north parts of Europe and America. Reindeer are gregarious and herd together. The full-grown bucks shed their horns. The horns of the female reindeer are retained during the winter. The reindeer feeds on the lichen that thickly carpets barren lands in the subarctic regions. The common European reindeer is domesticated in Lapland. Laplanders depend on it for its milk, and as a beast of burden, or to draw sledges over the snow. When the path is good and not too hilly, the reindeer can travel 100 miles a day. Their feet are well suited for walking on snow, owing to the manner in which the hoofs separate in treading, and to the long, coarse hair growing between the hoofs. The Siberian reindeer is larger than that of Lapland. The reindeer of North America are the cariboo or woodland reindeer, found in Canada and Maine, and the barren ground reindeer of the Rockies.

Rem′ora. A fish possessed of a structure which enables it to cling to foreign bodies. This is a modification of the dorsal fin, which becomes a flattened disk covering the top of the head, and acts as a sucker. Fables have arisen to the effect that this fish could arrest the course of a ship to which it attached itself. The species are from 12 to 20 inches long.

Rennet. [AS.] A preparation of the inner lining of the fourth stomach of a calf, used to curdle milk.

Reptile. [Fr., from L. *repere*, to creep.] Reptiles form the first class of the higher vertebrata, or of those which never breathe by gills, like the amphibians. Their blood is cold, and they closely resemble birds in the development of their young; but their eggs are very large. Reptiles include alligators, turtles, snakes, and lizards. Formerly amphibians were classed with reptiles, and are still properly called reptiles, though more closely allied to the fishes. Reptiles, except tortoises, are long, often nearly cylindrical, and usually covered with scales, and have long tails. The feet are of different lengths, but seldom suffice to support the body, the belly trailing on the ground when the animal is in motion. The mouth is large and armed with sharp, hooked teeth; but in tortoises no teeth exist. The heart generally has two auricles and one ventricle. The ribs are always well developed; the limbs when present are well developed; the feet are freely movable, and end in strong claws. Except tortoises, all reptiles are carnivorous, feeding upon living prey; their teeth not being constructed for the division of flesh, they swallow their victims whole. Reptiles are essentially inhabitants of the warmer regions of the earth. In earlier geological periods, before the age of the mammalia, reptiles were often quadrupeds of immense size and strength. Some were essentially tripeds, supporting themselves on their hind legs and tails; and some gained the habit of flying, with the aid of membraneous wings.

Res′in. [Fr., from L. *resina.*] A half liquid substance, that flows from trees. Resins are made up of carbon, hydrogen, and oxygen, and are probably the essential oils of the plants oxidized by the oxygen of the air. They dissolve in alcohol and ether and volatile oils, but not in water, like gums. Copal, lac, mastic, and benzoin are hard resins; turpentine and copaiba are soft resins. The common resin of commerce exudes from the pine tree, and is largely used in making varnishes and in several medicines.

Ret′ina. [L. *rete*, a net.] A fine net-like coating at the back of the eye, made up of the optic nerves which carry the sense of sight to the brain. The optic nerve and retinal blood-vessels spread out on the front of the retina, and the sensory layer, with rods and cones, is on the back part next the choroid coat.

Retort′. [L. *retortus*, twisted back.] A vessel with a long bent tube used by chemists in decomposing substances or in distilling. For distilling liquids a glass retort is employed. Metal retorts are used in distilling coal, wood, or bones.

Retriev′er. [Fr.] A dog trained to find and bring back game that has been shot or wounded.

Revolv′er. A pistol with several chambers revolving on an axis, that can be fired one after another by the same trigger through the same barrel.

Rhe′a. The American ostrich. This is scarcely

more than half the size of the African species, and differs from it in having the head feathered. It is gray in color, and has none of the beauty of the true ostrich. It is abundant in South America.

Rhe′ostat. A resistance box in the path of an electric current, for the purpose of increasing the general resistance to the current flow. The box contains coils of wire made of a metal that is a poor conductor of electricity. When the current is first turned on to a motor, as that of a streetcar, it is important that it should be done gradually, so that the motor will not start off at once with full force. This is accomplished by sending the current through a rheostat. If the box have 12 coils, the current is sent at first through the whole of them, then, by turning the handle, through 11, 10, 9, and so downward, until all the coils are cut out and the entire strength of the current reaches the motor, and sets it turning at full speed.

Rhinoc′eros. [Gk. *rhis*, *rhinos*, the nose; and *keras*, a horn.] A hoofed animal with a horn, and next in size to the elephant. Its horn is placed upon the skin behind the nostrils. It is not unlike whalebone, and is made of a number of fine hairs firmly glued and pressed together. The point of the tip is very smooth and quite sharp, but the lower part where it joins the skin is rough. It is very heavy, and is made into drinking-cups. The Indian or white rhinoceros and the Javan rhinoceros have one horn. Two or three African kinds have two horns, but no canine or incisor teeth. The lower horn stands straight out from the head, and is often 4 feet long. The rhinoceros is from 4 to 5 feet in height and 11 in length, and has such a thick, tough skin that nothing can pierce it, therefore the natives make it into shields. The rhinoceros has a savage temper, and is a dangerous enemy. It lives alone in thick forests by the banks of rivers; for it is a great swimmer, and spends a great portion of its time in water, where it can easily find leaves and grasses for food. It has on each foot three toes, with a hoof on each toe.

Rhododen′dron. [Gk. *rhodon*, a rose; and *dendron*, a tree.] A kind of shrub of the Heath family, with evergreen leaves and large, showy flowers like roses. No other shrub equals it for beauty of form and foliage and profusion and variety of flowers. It is abundant in the mountain regions of the eastern United States, often forming impenetrable thickets in the northern Alleghanies. It is also common in India. Several species have been domesticated and a great variety of very handsome flowers produced by cultivation.

Rhu′barb. [L. *Rha*, Volga; *barbarus*, foreign.] A plant (*Rheum rhaponticum*) brought from the banks of the Volga, the stalks of which are used as food. The stalk is large and fleshy, and very juicy; the blade is broad, with large veins running from the foot-stalk. The stalk and veins are smooth, and covered with a fine thin skin easily removable when the leaf is young. It is used as a substitute for fruit in pies and tarts, and the juice is pressed into wine. Rhubard of medicine is the dried root of a wild plant (*Rheum officinale*) now chiefly brought from China and Tibet.

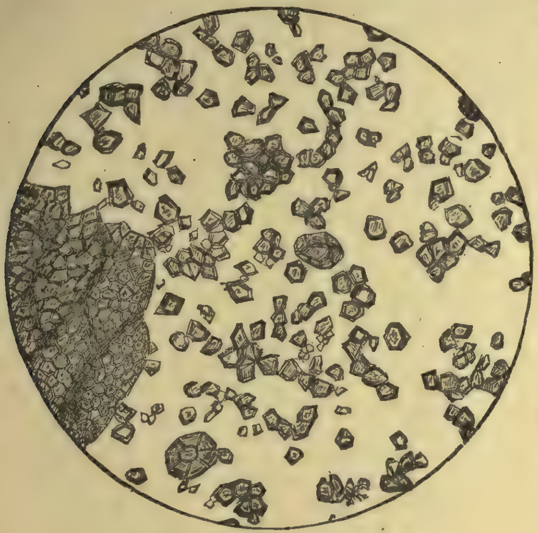
Rib′bon or **Rib′and.** [Celt.] A long, narrow web of silk or other material used for trimming dresses. Ribbons are chiefly made at St. Etienne in France, Basle in Switzerland, Coventry in England, Crefeld in Prussia, and Paterson, New

THE AGE OF REPTILES.

Jersey. French and Swiss ribbons are handmade; English ribbons are machine-made. Italian and French silk is used in making the best ribbons.—*Ribbonfish* is a fish of the North Atlantic, 20 feet long.

Rice. [Fr., from Gk. *oryza*.] A grain grown in warm countries, and forming a food for three-fourths of the human race. Rice is a kind of grass, having a stalk with several stems, each of which

bears a cluster of grain. It requires a hot climate and abundance of water. The plant is a native of the East Indies, and is most largely grown for food in India and China, but it is grown also in the southern United States and in the south of Europe. Its habits of growth have been modified by cultivation, so that a variety is grown on uplands without irrigation. The lowland crops are grown with irrigation on lands where no other



RICE STARCH UNDER MICROSCOPE.

crop is possible. Rice flour is used for cakes, and rice water is used medicinally. Rice forms the chief food of the Chinese and the Hindus. It contains in 100 lbs. no less than 76 lbs. of starch, which is largely used in the laundry to stiffen linen, etc.

Ri′fle. [Dan., to make grooves in.] A gun, or small-arm, the inside of whose barrel is *rifled*, that is, has spiral grooves cut in it. The effect of the grooves is to send the balls swifter and straighter. The rifles now used are breech-loaders. Cannon are also rifled, with the effect of enormously increasing their range and powers of destruction.

Rin′derpest. A malignant contagious fever, which attacks cattle and other ruminants. It came originally from Asia, and has very often appeared in Russia, from which it made its way over Europe, probably as early as the 4th century. There have been various outbreaks of it, causing great destruction of cattle. From 1865 to 1870 it caused great mortality, 130,000 cattle dying in France alone in 1870. In 1896 a serious epidemic broke out in Africa, extending from Abyssinia to South Africa, and decimating the domestic herds, while destroying great numbers of wild animals, especially antelopes. No cure is known for this disease, and the only safety is to kill and bury all infected animals.

Riv′et. [Fr., from Scand., to fasten.] A pin or bolt of metal passed through two flat pieces of metal, wood, etc., and fastening them together by its being hammered flat at both ends.—*Butt riveting*. The ends or edges of plates form a butt joint, and are fastened together by being riveted to a narrow strip which covers the joint. *Lap-riveting*. The ends or edges of plates overlap, and are riveted together.—*Chain-riveting*. The rivets in two or more rows are set behind each other.

Roach. [AS.] A European fresh-water fish of the Carp family, to which the dace and chub belong, of silver-white color, with a greenish back. The scales of this fish and the bleak are said to be employed in the manufacture of artificial pearls. Gold-fish belong to a similar family.

Rob′in. [From *Robert*.] A name given to red-breasted birds of different countries belonging to the thrush family. The robin of the United States is a common and favorite bird, its song being among the sweetest of those heard in our groves and orchards. The robin-redbreast of Europe is a smaller bird, which seems to delight in the presence of man, often entering his dwelling. It sometimes takes up its abode in houses in cold weather, while it warbles its song when the sun shines or the fire burns brightly.

Rock′et. [Ital., from *rock*, a distaff.] A fire-work sent up through the air and used as a signal. The rocket is projected by the force of expanded gases liberated by the combustion of such ingredients as nitre, charcoal, and sulphur. Congreve rocket, invented by Sir William Congreve, is armed with shells or case-shot, or with a fiery composition.

Rock-oil. (See *Petroleum*.)

Roco′co. A florid style of ornamentation which was common in Europe in the latter part of the eighteenth century.

Ro′dent. [L. *rodens*, gnawing.] A gnawing mammal, as a mouse or rat. They are all small, but very prolific, so that no mammalia are so generally distributed. Their teeth are peculiar and of two kinds—incisors and molars. The enamel remaining, while the body of the tooth wears away, gives it a peculiar curved shape.

Roe. [Scand.] The spawn or eggs of fishes and amphibians, especially when enclosed in a membrane.

Roe. [AS.] The smallest kind of European deer. Its antlers are small, with three short branches. It remains faithful to one partner for life.

Roent′gen Ray. On December 4, 1895, Professor Roentgen, of Würzburg, Prussia, published a description of a remarkable new ray of light he had discovered, which he called the "X-ray." This light flows from a Crookes tube, which is a glass tube exhausted of air, and traversed by an electric current. From the interior glow in this tube there flows a ray differing from ordinary light, since it fails to pass through some transparent substances and readily penetrates many opaque substances. It passes easily through human flesh, and less easily through bone, so that the bones of the body may be photographed

as dark shadows. An important fact is that any foreign substance in the body, as a bullet, a needle, etc., is revealed by the ray, and its exact location fixed. This renders the Roentgen Ray of the greatest value in many surgical operations.

Rook. [AS.] A bird like the crow, but smaller, with the base of its beak bare of feathers and quite white, and with a harsh, croaking voice. It feeds on grubs and worms, but will pull up new

SIGNET RINGS.

grass and potatoes, pick turnips, and steal eggs. Rooks are sociable birds, and build their nests together and live as one family. They usually settle in a clump of high trees, which is called a *rookery*.

Ro′sary. A series of prayers marked by beads, consisting of fifteen decades, each containing ten *avemarias*, a *paternoster*, and a *gloria patri*.

Rose. [L. *rosa*.] A shrub, usually with prickly stems, and large, beautiful, and sweetly-smelling flowers. The varieties of roses are generally classed as damasks, banksia, noisette, perpetuals, French, Chinese, Scotch, celestial, and moss roses. All may be propagated by layers, some by budding or grafting, and many by separating the roots. The moss rose came from Holland, the cabbage rose from Caucasus, and the yellow rose from Persia. In France the cultivation of the rose is a science. The varieties are great; of the tea rose alone there are 122 kinds. The Cherokee rose is a native of China, which has run wild in the American States. The sweet brier has also escaped from cultivation, and is found in the hedgerows. The oldest rose-bush in the world is at Heldersheim, in Germany. The trunk is as large as a man's body; and in the year 1079 a framework was put up to support its branches. It is supposed to be over 1,000 years old.—*Otto of roses* is an oil distilled from petals or leaves of damask or musk roses. The best otto of roses is made from Cashmere roses in India.

Rose′mary. [L. *ros*, dew; and *marinus*, belonging to the sea.] A small shrub, with narrow grayish leaves, a fragrant smell, and bitter taste. It is an emblem of constancy. This shrub grows wild along the Mediterranean coast, and is found in Asia Minor and in China. An essential oil distilled from it is used in perfumery and medicine.

Rose′wood. A leguminous wood of a dark-red color streaked with black, with a faint smell like that of the rose. The finest rosewood comes from South America, especially from Brazil, but also from Jamaica, New South Wales, and the East Indies. The best is costly, and is chiefly used as veneering for cabinet-work.

Ros′in. The hard amber-colored resin left after distilling the volatile oil of turpentine.

Ros′trum. [L. *rostrum*, a beak.] The platform in the Roman Forum from which orators spoke to the people; so called because it was near where the beaks of ships taken in war were fixed. Also now any platform for speaking from.

Row′an Tree. [Scand.] The mountain ash, related to the apple, with pinnate leaves and small white flowers, followed by little bright-red berries.

Rub′ble. [Old Fr.] Rough stones from the quarry, or stones broken or worn with water, used for coarse building.

Ru′bric. [L. *rubric*, red chalk.] A part written or printed in red to distinguish it from the rest on a page.

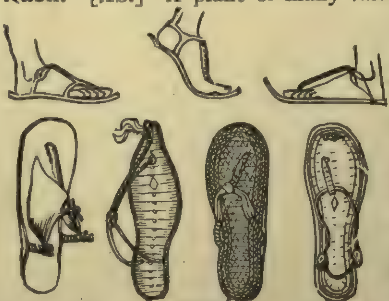
Ru′by. [Fr., from L. *rubeus*, red.] A precious stone of a blood-red color, ranking in hardness next to the diamond. It is a red crystallized variety of corundum. The finest are Oriental rubies brought from Burmah, and are more valuable than diamonds of the same size. They occur in crystalline limestone, and consist of pure alumina, with the color of pigeons' blood. The spinal ruby consists of alumina and magnesia, and is found in Ceylon and Siam, varying from deep red to rose red in color.

Rum. A kind of spirit made from the juice of the sugar-cane or molasses. It is largely made in the West Indies and New England. Jamaica rum is colored reddish brown with caramel. Rum is sometimes flavored with pine-apple.

Ru′minant. [L. *ruminatus*.] An animal that chews the cud. (See *Digestion*.) Ruminant animals include the camel, deer, antelope, goat, sheep, and cattle.

Rupee′. [Sans., silver.] An Indian silver coin worth 16 annas, the value of which varies with the price of silver.

Rush. [AS.] A plant of many varieties, with a round pointed stem and no leaves, which grows in moist ground. Before carpets came into use, the floors of houses were strewn with rushes, and the wicks of candles were made from the pith of rushes. Chair-bottoms and baskets are sometimes woven of them.



SANDALS.

Rust. [AS.] *Blight*, *mildew*, and *rust* are names given to diseases which attack the stems and leaves of cereals and other plants. They first appear as small discolored patches, and gradually spread over the entire plant. This

discoloration is due to the presence of germs or seeds of the rust fungus in the first stage of life. These germs or seeds, after several stages have been passed, settle upon the plants and live on their juices, thus doing much injury.—*Rust* is also the reddish-brown coating formed by oxidation on the surface of iron when exposed to a moist atmosphere.

Rye. [AS.] A kind of grain, and the hardiest of the cereals cultivated in the British Isles. It looks like wheat, but its ears are bearded like those of barley, but not quite so long. The grain is brown, and coarser than wheat. It will grow on poor sandy soils, and is able to bear a severe climate. Rye is sown in autumn. The "black bread" eaten by the peasantry of Russia and North Germany, and the rye-cakes of Sweden, are made from the rye which is very extensively grown on the sandy plains of those countries. Much whiskey is made from rye in the United States, and it is used with barley for making gin in Holland. Rye-straw is tough, and is not good for cattle, but is used for hats, stuffing beds, or thatching.

S

Sa′ble. [Fr., from Russian.] A small flesh-eating animal akin to the weasel, found in Siberia and northern countries, and valued for its glossy fur, which consists of a soft under-wool overtopped with longer hair. In summer the fur is brownish, with gray spots on the head and neck; but in winter it is deep rich brown and almost black. Winter fur is most valued, and is worn by ladies and by officials on their robes. The tail is made into artists' pencils and brushes. The sable spends most of the day in trees, and hunts at night. Its food is chiefly hares and small game. This animal is now getting scarce in Siberia, where it used to be hunted by Russian exiles.

Sa′bre. [Fr., from Ger.] A sword with a broad heavy blade, thick at the back, and curved slightly toward the point, used by cavalry.

Sac′charin or **Sac′charine.** [Fr., from L. *saccharum*, sugar.] Saccharin is a product of coal-tar, and it is said to be three hundred times sweeter than sugar It is a valuable therapeutic, and has been recently used in the preservation of fruits.

Sad′dle. [AS., from root of *sit*.] A seat generally made of leather, fastened on a horse's back. The frame of the saddle is usually of wood and iron, made to fit the horse's back, and is called the tree. In the common saddle the tree is raised a little in front to form the pommel, and behind is a ridge called the cantel, the seat and flaps being made of tanned pig-skin. The stirrups are fastened to the tree. When the saddle is put on the horse, the girths are passed under the horse, and buckled tightly to straps. *Side-saddles*, used by women, have only one stirrup, in which the left foot is placed; and on the pommel are two horns, between which the right knee is placed.

Safe. [Fr., from L., *salvus*, safe.] A strong room or box for keeping money and valuables safe from fire and thieves. Safes are double wrought-iron chests, with plaster of Paris and mica or alum to resist heat. Burglar-proof safes are usually fitted with locks (*q.v.*) difficult to pick.

Safe′ty-lamp. A lamp for giving light in mines, covered with wire-gauze, to prevent the light from setting fire to explosive gas; called also Davy lamp. (See *Lamp*.)

Safe′ty-valve. A valve in a steam engine arranged to permit the steam to escape when it exceeds a certain pressure. The valve is held in place by a weight attached to the end of a lever, and so adjusted that a fixed pressure of steam will lift it, and open a passage for the steam.

Saf′fron. A yellow coloring matter, obtained from the stigma, or flower centre, of a species of crocus. It is costly on account of the labor of picking the small stigmas. It has a pleasant perfume, and is used to color and flavor confectionary, cheese, and butter. Saffron tea is sometimes given to canary birds when shedding their feathers.

Sage. [Fr., from L. *salus*.] A grayish-green herb much used in cookery and medicine; so called from its supposed healing powers. It has a sweet smell and a bitter taste. The scarlet sage and Mexican red and blue sage are cultivated in America for ornament.

Sa′go. [Malay.] The prepared pith of a tree called the sago-palm, which grows in China, Japan, and the East Indies. The tree is cut down when fourteen or fifteen years old, the trunk split open, and the pith scraped out and washed in water. It is then squeezed through a sieve and dried, and is called pearl sago, and used for puddings. In 100 lbs. of sago there are 83 lbs. of starch. Much false sago is made in Germany from potato starch.

SALMON LEAPING.

Sal′ad. [Fr., from Ital. *salata*, salted.] Raw herbs cut up and dressed with salt, vinegar, oil, etc., as a relish for food.

Salaman′der. [Fr., from L. or Gk.] A kind of reptile with four feet, long body, and long tail, but without scales. It is related to the frog, and was once supposed to be able to live in fire.

Sali'va. [L.] A liquid of an alkaline re-action which, secreted by the salivary glands from the blood, moistens the mouth and mixes with the food to help digestion. The salivary glands are excited to pour out saliva by the movement of the jaws in chewing and in talking. Touching any part of the mouth will cause saliva to flow. The sight, smell, or taste of food when one is hungry will "make the mouth water." When food is eaten hastily, and not moistened with saliva, the stomach is disarranged, and indigestion follows. Its action in digestion is due to the presence of ptyalin.

Salmon. [L. *salmo.*] A large fish much valued as food. Its color is bluish-gray, shading into a silvery-white underneath, and marked with black spots on the upper part of the body. Salmon are found on the European and American coasts of the Atlantic, passing up the rivers to deposit their eggs. On these journeys they pass waterfalls and other obstacles; but several British and Norwegian rivers contain salmon-leaps or fish-stairs, up which the salmon leap from step to step. After resting on the spawning-ground for eight or ten days, the females return to the sea. The eggs left in the gravel hatch out. The young fish increase little while in fresh water, but on reaching the sea they grow quickly. Salmon are now reared in farms or breeding-troughs, with fresh water flowing freely through them. A salmon usually weighs 10 or 12 pounds, but fish up to 30 or even 40 pounds have occasionally been caught. Salmon-trout and bull-trout are two kinds of salmon. *Parr* are salmon fry; *smelt* is a young salmon; *grilse*, a young salmon returned from the sea. The common salmon of Europe and the Atlantic is the *Salmo salar*. The salmon of the North Pacific belongs to a different genus, the *Oncorhynchus;* and the quinnat, the largest of these, does not feed in fresh water, and dies after spawning. They are caught in immense numbers in the rivers from California to Alaska, many millions of pounds being canned annually.

Salt. [AS.] A substance found in the earth, and very abundant in sea-water, used for seasoning and preserving food. It is composed of sodium combined with chlorine. Salt is important as an article of food, and the lower animals like it; farmers place lumps of rock-salt in their fields for the sheep and the cows to lick. In North America there are certain places where the rocks contain much salt, and wild animals flock in great numbers to these places, which are known as "salt-licks." Salt forms solid beds in the crust of the earth, just as coal does; and in this state it is known as *rock-salt*. Rain-water, sinking into the ground, dissolves much of the rock-salt; and if a well be dug down to this salt water, it can be pumped up, and the salt obtained from it by evaporation crystallizes in cube shapes. The salt water is called *brine*. Salt can also be obtained by evaporating sea-water. In the Carpathian Mountains there are beds of salt from 600 to 700 feet thick. Near Cracow there is a wonderful salt-mine over a thousand feet deep, divided into floors, galleries, and passages, all of salt. One division is so like a church that it is called St. Anthony's Chapel. It has an altar, pulpit, and statues. Another room has a tomb made of salt. The passages are estimated to extend 300 miles. Rock-salt is abundant in many parts of the United States, and great quantities of brine are pumped up and evaporated in New York. Large deposits exist in Michigan, Louisiana, Utah, Nevada, and elsewhere.

Salt'petre, Nitre, or Rock-salt. [Salt; and Gk. *petra*, a rock.] A kind of white salt made up of nitric acid and potash, often found oozing from rocks. It is bitter in taste, and is called potassium nitrate. It is found in caves or got from the soil in Egypt, Persia, and India. Its principal use is in making gunpowder and in preparing nitric acid, sulphuric acid, in making fireworks, and medicinally for rheumatism. *Chili saltpetre* is a sodium nitrate, which cannot be used in making gunpowder, but from which nitric acid is got.

SCREW PROPELLER.

Salts. Salts, in chemistry, are the neutral or other compounds formed by the union of an acid and a base.

Sand. [AS.] Fine particles of stone on the sea-shore or in deserts, made by the wearing out of rocks, especially of quartz, silica, or flint. River-sand and sand from pits are usually sharper than sea-sand. The colors of sand are made by various oxides of iron. Sand is used in making glass, mortar, cement, sand-paper, molds for casting, and in sawing stones and grinding cutlery.—*Sand-blast* is a stream of sharp sand let fall from a high box on a plate of glass to cut it and make it look like ground glass. Metals and stones may also be cut by the sand-blast. The parts not requiring to be cut or engraved are covered with leather, paper, or wax.

San'dalwood. [Fr., from Sans., and *wood.*] A yellowish heart wood of trees in the East Indies and the Hawaiian and South Sea islands. It has a pleasant smell.

Sand'piper. A numerous family of game birds living on the sea-shore. The European kinds include the common sandpiper, called also summer-snipe, the dunlin, the knot, and the ruff. Some small plovers are called sandpipers. In North America are the pectoral, the purple, the red-breasted, and the spotted sandpipers.

Sand'stone. A rock of sand pressed together. Old and New Red Sandstone are two extensive series of British rocks, the one below and the other above the coal-measures. The terms Permian and Triassic have taken the place of the name New Red Sandstone. *Flexible sandstone* is a fine-grained variety of itacolumite, which, owing to scales of mica, is quite flexible.

Sand'wich. Two thin slices of bread with meat, cheese, or butter between them; first used by the Earl of Sandwich in the 18th century so that he need not leave the gaming-tables.

San'talin. A substitute for butter extracted from suet.

Sap. [AS., *saep*.] The fluid which flows through plants. The raw or crude sap consists of much water, with plant-food dissolved in it, entering through the roots. It rises through the outer part of the stem into the leaves, and is there converted into various non-nitrogenous substances, composed chiefly of carbon, hydrogen, and oxygen, such as starch, gum, sugar, cellulose, and oil. In the sap there are also formed substances containing nitrogen, such as albumen and gluten. These substances are distributed to every part of the plant, helping to form and to fill new cells, and so aiding the life of the plant.

Sap'phire. [Fr., from Gk., from Heb.] A precious stone of a bright-blue color, next in hardness to the diamond, and next to the ruby in value. It is composed of alumina, colored differently. The red sapphire is the Oriental ruby, the green sapphire is the emerald, the yellow the topaz, and the violet is the amethyst. Colorless or white sapphires are sold as diamonds. The finest blue sapphires come from Ceylon.

Sar'dine. [Fr., from L. *sardina*.] A small pilchard or herring found near the island of Sardinia, and preserved in oil for food. It has a slim body, and is greenish blue on the back and silvery white below. It is also caught off the north-west coast of France and in the Baltic. American sardines are young herrings or menhaden. The sardines appear in large shoals in spring, and are caught in nets which are large enough to let their heads through, but catch them by the gills and fins. They are washed, scraped, salted, heads and gills cut off, washed again, and dried. They are then cooked in olive oil and dried again, and then packed in tin cases with boiling oil. Sprats, roach, and dace are sometimes put up in this way.

Sarsaparil'la. The dried roots of several American climbing evergreens, reaching from Mexico to South America. It is much used as a medicine. There is none of it in the sarsaparilla syrup drank in soda water.

Sas'safras. [Cor. from *saxifrage*, which now denotes a different kind of plants.] A kind of tree or plant, with aromatic properties, of the laurel kind, and allied to cinnamon, cassia, and camphor. Every part of the plant has a pleasant fragrance and a sweetish aromatic taste, which is strongest in the bark of the root. It occasionally grows to a height of 50 or 60 feet, and has a grayish and deeply-furrowed trunk. It is sometimes called the *ague-tree*. Its bark is used in dyeing, but also especially the bark of the root medicinally for rheumatism. The leaves are used in making root beer. The wood is tough, and does not decay.

Sat'in. [Fr., from L. *seta*, silk.] A kind of closely-woven silk cloth with a glossy surface. It is an elegant material. The woof, or crosswise threads, passes over several threads of the warp at a time. The fabric is then passed between heated iron rollers, which give a smooth, glossy appearance.

Sat'in-wood. A hard fragrant wood like yellow mahogany, from the East and West Indies. It takes a lustrous finish, and is used in cabinet-work.

Sat'urn. The planet next beyond Jupiter, and almost twice as distant, it being 875,000,000 miles from the sun. In size it comes next to Jupiter, its diameter being 73,000 miles. Its year is equal to nearly 29½ earthly years, and it rotates on its axis in 10 hours. In addition to its nine moons—one of them recently discovered—it has a remarkable feature in its two—or perhaps five—wonderful rings, which surround it at a distance of some 20,000 miles. These rings are supposed to be made up of meteors rotating in company around the planet.

Savan'nah. An extensive open grassy plain in the Southern States. (See *Prairie*.)

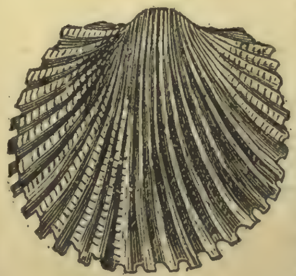
Sauer-kraut. A salted preparation of cabbag much esteemed in Germany, and largely used in the United States. It is thought to be very wholesome and easily digested, and is prepared in large quantities for winter use.

Savoy'. [Fr.] A kind of cabbage with curled leaves, originally from Savoy, much cultivated for winter use.

Saw. [AS. *saga*, from L. *secare*, to cut.] A thin steel blade with sharp teeth on its edge for cutting wood, etc. The chief kinds are the handsaw, the cross-cutting saw, and the circular-saw, which is worked by machinery. The blades are of steel, the teeth being punched out by machinery, then ground and set and cleaned by emery. The *saw-gin* is the same as the cotton-gin, used in clearing the cotton fibre of its seeds.

Saxi'frage. [L. *saxum*, stone; and *frangere*, to break.] A kind of plant growing in the crevices of rocks or on high hills, once supposed to have the power of dissolving or breaking stone in the bladder. They are mostly perennial herbs.

Scale. [AS. *shell* or *husk*.] One of the thin plates covering the body of a fish or of a reptile. Ganoid scales of fish like the gar and sturgeon are an inner layer of bone and an outer layer of shining enamel arranged to form a coat of mail. The Perch family have comb-like scales. Those of the herring and salmon are thin, with concentric lines of growth, and serrated on the margin, and are called cycloid scales.



SCALLOP.

Scale. [L. *scala*, a ladder.] A scale in music, is a series of tones from the keynote to the octave. A *chromatic scale* includes 8 tones and 5 half-tones. A *diatonic* or major or minor scale has eight sounds or tones.

Scal′lop. [Old Fr.] A shell-fish radially ribbed, and having the edges of its two-valved shell formed into a series of small curves. The shell is light, and the fish has a little air-bag which enables it to float. It abounds on the English and American coasts, and on the shores of Palestine. Formerly the shell was used to cook oysters in. An edible scallop is found on the Atlantic coast of the United States. The shell of the Palestine species was formerly worn by pilgrims to show that they had visited the Holy Land.

Scar′let-runner. A bean-plant with scarlet flowers which clings to and runs up any support it can reach.

Schoon′er. [AS., to glide.] A vessel with two or more masts, fore-and-aft rigged, or square-rigged on the fore-mast top-sail. The first schooner is said to have been built in Massachusetts in 1713.

Scis′sors. [Old Fr.] A pair of blades movable on a pin through the middle of both, which cut when the sharp edges are pressed together. The best are made of cast steel or shear steel. Often called a pair of scissors.

Scor′pion. [L.] An arachnidan somewhat like a lobster, having a poisonous sting in its tail. It has a flattened body, and a long, slender lower abdomen, formed of six movable segments, the last of which ends in its sting. Its poison causes pain, but is seldom destructive of life. Scorpions are found in warm climates.

Screech-owl. An owl which utters a shrill cry, and is also called the barn-owl. The screech-owl is small, and of a gray or reddish color.

Screw. [Old Fr.] A round piece of wood or metal with a sloping ridge called a thread running round it for fastening things together. As a mechanical power the screw is a modification of the inclined plane. The flipper of the sea-bear, the wing of the insect, of the bat, and of the bird are screws in principle, resembling the blade of the propeller, and they twist and untwist during oscillation.

Screw′-driver. A tool for driving in screws It has a thin end to enter in the slot or nick in the head of the screw.

Scut′tle. [AS , from L. *scutella*, a tray.] A broad basket or a vessel for holding coals. In nautical phrase, a small opening or hatchway in the deck of a ship large enough to admit a man.

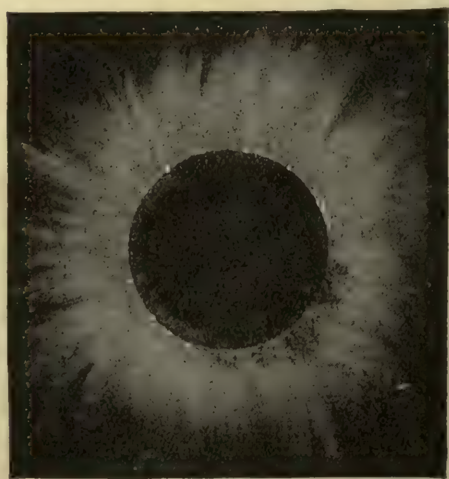
Scythe. [AS.] A large curved blade fastened to a long handle, for cutting grass, corn, or crops on small farms. Scythe-blades are forged, and then ground on grindstones. The haft is made of bent wood, with two handles.

Sea. [AS.] A large body of salt water smaller than an ocean, though the term is often applied to the whole ocean. The ocean covers nearly 8-11ths of the area of the globe, and its depth averages 2,000 fathoms. The salts in the sea are on an average 3½ per cent., the remainder being water. Of the salts, nearly 78 per cent. is chloride of sodium, 11 per cent. is chloride and bromide of magnesium, and 10 per cent. sulphates of lime, magnesium and potash, with a very small quantity of carbonate of lime. The usual tint of the sea is bluish-green; but the color of the soil or the color of the sky, and other local circumstances, produce many variations. The sea is inhabited by a vast number and variety of animals, from the simplest forms to the fish, reptiles like the turtle, and mammals like the whales and seals. Many forms are found at great depths in the water, some of these being phosphorescent; some are blind, others have very large eyes. There are also many small phosphorescent animals on the surface, so abundant in places that the ocean seems like a sea of fire.

Sea′-anemone. (*Actinozoa*, or ray-like animals.) A soft, pulpy polyp with a flower-like or ray-like fringe of tentacles, in the middle of which is the mouth, leading into a hollow sac or stomach. It is of the shape of a column, with a sucking surface in the base that enables it to move much like a snail, but more slowly. From the tentacles are thrown small darts, by which it seizes any crab or worm or small fish for food.

Seal. [AS., from L. *sigillum*, a seal.] An engraved stamp for marking wax or wafer to confirm or make sure.

Seal. [AS.] A flesh-eating animal found in great numbers lying on the icebergs or swimming in the waters of both north and south polar regions. Their sharp-pointed teeth enable them to catch the slippery fish on which they feed. The different kinds of seals vary in size and in the color of their fur. The head, shoulders and



SOLAR CORONA.

chest are round, and the body tapers towards the tail. All their feet are webbed; but the webs of the back feet can be folded up like a parasol, so that they are able to lie close to the body. The webs of the front feet are always stretched out. As the seal lives almost entirely in the water, it has the power of closing both its eyes and its ears. Its body, too, is thickly covered with

double fur, which is kept constantly oiled, so that the fur next the body is never wet. Several species are much hunted for their oils and skins, including the common seal, found in the Atlantic and the Pacific, and the harp seal, abundant in Arctic waters. There are other species in the north Atlantic, while in the southern ocean is found the great sea-elephant, so called from its size and the elongation of its nose into a short proboscis. The males of this species are 20 feet long, the females little more than 10 feet. There are other species known as sea-leopards in the southern waters, while in the north Pacific are the sea-lions and sea-bears. Both of these have long hair, but the sea-bears have also a soft and delicate fur, which is highly valued as the seal-skin of commerce. The northern fur seal has its breeding grounds on some small islands in the Behring Sea. These belong to the United States, and only a limited number are permitted to be killed yearly. The killing of these seals in the open seas by Canadian seal fishers, gave rise to a serious international question between Great Britain and the United States.

Seal′ing-wax. Wax used for sealing letters or for being marked with a seal. Gummed envelopes have almost taken the place of wax for closing envelopes. Wax is made of lac mixed with turpentine and resin; black wax is colored with ivory black, and red with cinnabar.

Seanettle. A jelly-fish or medusa.

Seaurchin. (*Echinus.*) A kind of shell-fish or sea-egg covered with prickles like a chestnut bur, and closely related to the star-fish. The shells are of the thickness of egg-shells, and have rows of dots or knobs with lace-work between, and are made up of hundreds of plates joined like mosaic work. The animals do not cast their shells like crabs, but the flesh secretes lime from sea water, and deposits it round the plates, which increase uniformly. The spines are beautifully carved columns with ball-and-socket joints on the knobs. There are also protruding through holes double rows of tube-like feet, which are supplied with water by a tube opening at the top of the shell. In the centre of the shell is a tube-like stomach opening to the top of the shell. The sea-urchin has also a mouth, intestines, heart, and five teeth. There are many kinds.

Search-light. An electric arc-light of great candle-power, used with a parabolic projector which throws its rays for many miles. It is of great importance on a naval vessel, in enabling the captain to discover an approaching enemy at night. One shown at the Chicago Exposition of 1893 could be seen 85 miles away, and fine print was read by its light at 8 miles' distance.

Sec′retary-bird. The crane-vulture of South Africa and the West Indies. It is easily tamed, but attacks and kills poisonous snakes. Its tail is very long, with two long middle feathers. It has a crest on the back of its head of six pairs of feathers, like the pens behind the ears of a clerk, hence its name.

Secre′tion. A substance separated by any one of the glands from the blood, either to be used for some purpose in the body or to be discharged as useless and detrimental. Some of the secretions are sweat, saliva, bile, and milk.

Sedan′. [From *Sedan*, a town in France.] A covered chair for one person, carried by two bearers on poles with the hands, and differing from palanquins, which are carried on the shoulders. There are no carriages in the streets of Canton, their absence being supplied by nimble sedan bearers. Sedans were introduced into England in the seventeenth century.

Sedge. [AS.] A kind of coarse grass with blades shaped like swords, and found in swampy ground. It has a triangular jointless stem, spiked inflorescence, and long leaves, rough on the margin and mid-rib. There are several hundred species.

Seed. [AS.] The part from which a new plant grows, consisting of one or more coats or skins and the kernel, which is made up of the embryo and albumen to feed the embryo. Some albumen often forms a part of the embryo. Embryos

SUN SPOTS.

are divided into those with one cotyledon or seed-leaf, as grasses; those with two cotyledons, as the bean; and those with more than two, as pines.

Seid′litz. [From *Seidlitz*, in Bohemia.] A natural mineral water; also a powder having the same effect. The seidlitz owes its aperient property to the presence of Epsom salts (*q.v.*) and a little lime. Seidlitz powder has 2 drams of Rochelle salt and 40 grains of bicarbonate of soda in one paper, and 35 grains tartaric acid in another paper. When mixed these effervesce, and make a very pleasant draught.

Selt′zer. [*Selters.*] A mineral water from Selters, in Nassau, Germany. Its chief character is a large amount of carbonic acid in combination with alkaline carbonates, and also some common salt. It is useful for dyspepsia.

Sem′aphore. [Gk.] A means of signaling invented by Chappe in 1793. Formerly in railway signaling there were three positions: at right angles meant stop; at half a right angle, go slowly; hanging down, that the line was clear. Nowadays semaphores have two positions: when the arm is up, danger; when down, clear.

Sen′na. [Arab.] The dried leaves of a kind of cassia used in medicine as a valuable purgative. It grows abundantly in North Africa, in the West Indies, and in India. Egyptian senna has a high reputation. The leaves are long, lance-shaped, or broad, and are sometimes mixed with angel leaves, which have no veins. Epsom salts mixed with senna is called *black draught*, and is a strong purgative.

Sen′sitive-plant. The *mimosa*, a small plant with leaves which collapse and fold up when touched. It is a native of the American tropics, and is about a foot and a half high.

Se′pia. The cuttle-fish, a family of naked molluscs, with an oval body and with eight short arms surrounding the head, also two long arms or tentacles. It has an internal shell or plate along the back, known as *cuttle-fish bone.* It also possesses a bladder containing a black liquid, which it ejects when pursued, staining the water black so that it can escape. This secretion, obtained from the ink-bag and dried, is used as a pigment called India ink. This, when dissolved in potash, boiled and filtered, precipitated by an acid, and dried, becomes the pigment *sepia.*

Sequo′ia. The giant trees of California. They belong to the family of the pines, and are distinguished by their enormous dimensions, one of them having measured 112 feet in circumference and supposed to have been 450 feet high. The California redwood is a smaller species.

Serge. [Fr., from L. *sericus*, silken.] A kind of twilled cloth, first made of silk, now chiefly of wool, used for garments.

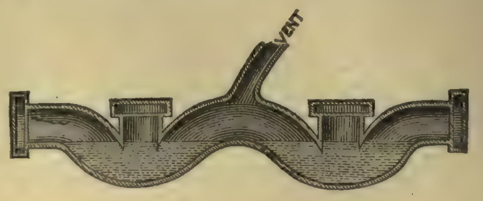
Ser′pent. [L. *serpens*, creeping.] An animal that creeps or winds about on the ground. They are divided into two classes—poisonous, as vipers and rattlesnakes; and snakes that are not poisonous, as boas, pythons, and many others. Serpents are vertebrate animals, without limbs, but some have rudiments of hind limbs. (See *Reptile*, *Snake.*) They are mostly long and slender, and move partly by bending the body into folds, and partly by clinging with their scales to rough surfaces. Many glide, others burrow, and some live in trees.

Ser′pentine. A magnesian rock, usually of a greenish color, sometimes spotted like a serpent's skin. Precious serpentine is translucent, and of a rich oil-green color. It is really chrysolite altered.

Set′ter. A dog taught to set or crouch when it sees the game. Originally it was a cross between a spaniel and a pointer.

Sew′er. [Fr.] A drain or passage to carry off sewage in cities. In Paris the sewers contain telegraph and telephone wires, compressed air or gas-pipes, etc. The ancient sewer (*Cloaca Maxima*) of Rome was large enough to allow a loaded wagon of hay to pass through. Sewerage has become a very important part of modern city administration.

Sew′ing-machine. A machine for sewing, of which the first effective one was introduced by



DOUBLE TRAP FOR SEWER.

Elias Howe in 1846. The Howe machine has a needle with an eye near the point. The thread carried through the cloth by this needle forms a loop under the cloth through which a shuttle passes. The shuttle contains a bobbin of thread, which unwinds as it passes through the loop, and the thread thus put through forms the lock-stitch. In addition to machines for ordinary sewing, there are many special inventions. The most important is the cylinder, with cylindrical feed, for shoe-work, gloves, pocket-books, and traveling-bags. Sewing-machines are now produced that make 2,000 stitches a minute. The button-hole machine can make 1,200 stitches per minute. Sewing-machines are usually fitted with a treadle, to be worked by the foot.

Sex′tant. [L. *sextans*, a sixth part.] An instrument for measuring angles, mounted on a frame, and marked with degrees, minutes, etc. It is constructed on the same optical principle as Hadley's quadrant.

Shad. A fish of the Herring family, but, unlike the herring, with a deep notch on the middle of the upper jaw, and without teeth on the tongue and the roof of the mouth. The Chinese shad is an esteemed food-fish. The European shad is little valued for food. The American is the choicest of food-fishes, and ranks highest among American fishes. It is twenty inches long, is bluish and silvery in color, and is found abundantly in the rivers of the Atlantic coast of the United States.

Shad′dock. A fruit of the Orange and Lemon family, but much larger. It is native to China and India, but is now grown in the West Indies. It is better for preserving than eating, though now, under the name of grape-fruit, it is much used as a dessert fruit.

Shagreen′. A kind of leather made from the skins of horses, wild asses, and camels, and so grained as to leave on it little grains or pimples. These are caused by forcing into the moist skin the hard seeds of an Asiatic plant. Shagreen is made at Astrakan, Russia, and other places. It is used for covering sword scabbards, instrument cases, etc.

Shale. [Ger., akin to *scale.*] A rock easily split into slabs. Bituminous shale is impregnated with bitumen, and often accompanies coal.

Sham′rock. [Celt.] A three-leaved plant like clover; the national emblem of Ireland.

Shark. A large, fierce, and powerful fish, called the tiger of the ocean. It sometimes reaches a length of 35 feet. It has a strong, stout body, and a tail of irregular shape, its upper section being longer than its lower. Its skeleton does not consist of bone, but of hard gristle; instead of scales its skin is set with hard knobs, and the gill slits on the side of the neck have no covering. Its mouth is on the under side of its head, and it has to turn before biting. It has several rows of teeth pointing backward and imbedded in the lining of the mouth. The female lays two eggs, with leathery cases, that have strings at each of the four corners. (See *Egg.*) The sharks are voracious, and in nearly every case carnivorous. Some sharks, as the basking shark and the whale shark, grow to an enormous size. Most sharks are harmless to man, but some species, as the white and the blue sharks, will attack and devour man. Another species, the man-eater shark, found in all tropical and temperate seas, grows to a length of 36 feet.

Shawl. [Per.] A woven or knitted covering for the shoulders, of wool, cotton, silk, or other textile material. India shawls are made from the wool of the Cashmere goat.

Shears. A large pair of scissors used for cutting wool from sheep or their skins, also the nap of cloth. *Shear steel* is prepared from blistered steel by repeated heating, rolling, and tilting to increase its malleability and fineness of texture. Two or more poles fastened together at or near the top, and steadied by a guy from which pulleys and ropes are hung for lifting weights or unstepping the lower masts of ships, are called shears.

Sheep. [AS.] A most useful ruminant animal, bearing wool, and valued for its flesh. The

domestic sheep is gregarious and very timid. Among fine wool sheep are the merino, the French, the Saxon, and Silesian; among coarse-wool sheep are the South Down, Cotswold, Leicester, and Cheviot. The meat of the fine-wool sheep is not as good as that of the coarse-wool sheep. The merino sheep is a native of Spain, and valued for its wool. It is now much bred in Saxony, Silesia, Bohemia, and Australia, while in the United States the sheep are 95 per cent. merinos. The merino differs from the English sheep in having wool on the forehead and cheeks. It is a large breed, with heavy horns, and with fine wool curling in tendrils. The Cretan sheep has long horns; the Turkish sheep has a long fat tail, which has often to be supported; the Asiatic sheep has four horns; the Rocky Mountain sheep, a wild species, is called *big-horn*, from its large-sized horns. The aoudad is an African sheep, having a long mane on the breast and fore legs. The argali and moufflon are wild sheep in Siberia and Sardinia respectively. The musmon is a wild species in European Turkey. The most common mode of cutting up a sheep is—(1) shoulder, (2) breast, (3) loin (best end), (4) best end neck, (5) scrag end neck, (6) head, (7) loin (chump end), (8) leg.

Shell. [AS.] The outer part of an egg or nut, the pod of peas, and the hard covering of some

SPINY SHELL.

kinds of ocean animals. Shell-fish are usually univalves, having one part; or bivalves, having two parts joined with a hinge. Shells are useful for protection, and their strength and thickness are generally in proportion to the dangers to which the animal is exposed. Those inhabiting shallow places near the shore and exposed to the beating of the waves have stronger shells than those living in deep water. Fresh-water molluscs generally have delicate shells. The thin layers of the oyster-shell are deposits of shelly matter showing the lines of growth. All living shells have an outer layer of animal matter called epidermis, and they have no lustre till this is taken off. Mussel-shells show beautiful blue tints when the epidermis is removed. The bodies of all shell-fishes are enclosed by a delicate membrane called a mantle, which secretes the shell. Among other animals the tortoise has a shell, whose upper part is made of the flattened spines of the vertebræ, and of the ribs, the shelly plates being merely portions of the skin hardened into shell. (See *Tortoise.*) There are many other animals that form shells, some of them being microscopic. Chalk is largely made up of the shells of these.

Shel′lac. [*Lac*, gum.] Lac or gum hardened and cut into thin plates. (See *Lac.*)

Sher′ry. A kind of light-colored wine, chiefly got from Xeres in Spain. It is colored a straw color or amber color by mixing cheap wine and boiling it down.

Shield. [AS.] A frame covered with skin or metal, worn on the left arm to keep off blows; also the escutcheon or field on which are placed the bearings in coats of arms.

Shil′ling. [AS.] A silver coin of the value of 12 pence or twentieth part of a pound.

Shin′gle. [Cor. from L. *scindula*, a wooden tile.] A thin piece of pine, cypress, cedar, or oak used as a roof tile; loose stones on the sea-shore or in the bed of a river.

Shin′gles. [L. *cingulum*, a girdle.] A disease which spreads round the body like a girdle.

Ship. A large sea-going vessel with masts and sails, particularly one with three masts rigged with square sails. It is made up of hull, deck (*q. v.*), masts, yards, bow-sprit and rigging, ropes and chains. The front mast is the fore-mast, the middle mast the main-mast, and the hindmost the mizzen-mast, and when a fourth is

used, the jigger. A full-rigged ship has from 21 to 24 sails, and a four-masted ship as many as 36 sails.

Ship'worm. A mollusc of unusual shape, whose scientific name is the *Teredo*. It looks like a worm, being long and slender in body. It bores with its cutting shell into wood, and often so riddles ship timbers with holes that they crumble at a touch. At one time these animals destroyed the piles which protected Holland from the sea, and a deluge was averted only by great labor and expense. They make long tunnels in wood which never break into one another.

Shod'dy. A fibrous fabric made of material obtained by tearing refuse woollen goods, stockings, rags, or druggets.

Shoe. [AS.] A covering for the foot, usually of leather. Fine shoes are made by the hand and shaped on a last, or are made by machinery.

ANCIENT SHOES OR SANDALS.

Shoes are largely made by machinery in the Eastern States of America, New York, and Philadelphia. *Wooden shoes*, much used by the peasantry of Europe, are cheap, durable, and comfortable, though clumsy. Shoes made of vulcanized rubber, as a protection against dampness, are much worn as over-shoes.

Shot. [AS.] Bullets or small pellets of lead shot from a gun. In war, some are composed of lead, wrought iron, or cast iron; they are spherical or oblong, and include hollow, solid, and case-shot. Chain-shot was formerly used in naval warfare to destroy rigging. Shrapnel shell is a projectile for a cannon, consisting of a shell filled with bullets and a small bursting charge to scatter them at any point while in flight.

Shov'el. [From *shove*.] A broad, slightly-hollowed blade with a handle for lifting and throwing earth, coal, grain, or other loose substances. A *steam-shovel* is a machine with a scoop or scoops, worked by a steam-engine, for excavating the earth in railway cuttings.

Shrew-Mouse. An animal brown in color, and very like a common mouse, except that the nose is much longer and more pointed, the stomach is white, and the tail is square instead of round. These little creatures are treated very cruelly. In some places many people believe that the bite of a shrew is poisonous, and that if one merely runs over the foot of a man or an animal sickness or even death will follow. The American water-shrew has fringed feet. The old Egyptians worshipped the shrew. Many mummies of this little creature have been found in their temples. In Scotland it is sometimes called the ranny; and also the fetid mouse, it having a musky smell, so strong that cats will not eat it, though they kill numbers. Like the mole, it makes long tunnels under the earth in search of food; but it makes its nest above the ground in any little hole it can find. Some of them are the smallest of all mammals.

Shrimp. [O.E.] A small crustacean, used as food, with a thin body, long feelers, and 38 legs of different lengths. Between its head and tail it has thin shells in six parts, jointed, and each working into its neighbor. Its tail is wing-shaped, and helps it to swim or jump through the water, and can be expanded or folded up. The larger kinds of shrimps are called *prawns*.

Shrub. [AS.] A tree-like plant or bush with no trunk but with several stems branching directly from one root.

Shut'tle. [AS.] That by which the weaver shoots or throws the thread from one side of the web to the other. The *shuttle race* is a shelf in the loom beneath the warp along which the shuttle passes.

Shut'tlecock. A cork with feathers, driven back wards and forwards by a light bat in the game of shuttlecock and battledore.

Sick'le. [AS.] A curved steel knife for cutting grain. The sickle has one side of the blade notched, so as always to sharpen with a serrated edge. The reaping-machine has now taken its place in harvesting operations. A grass hook or sickle is used for trimming grass borders or lawns where mowers cannot be used.

Sien'na. A reddish-brown pigment made from earth got from Sienna in Tuscany. This clay is colored by the oxides of iron and manganese. *Burnt sienna* is the same clay made redder by the action of fire.

Sieve. [AS.] A vessel with small holes in the bottom for separating fine particles from coarse ones. It is usually shallow, with the bottom made of wire, hair, or woven into meshes.

Sil'ica. [L.] The substance of which flint, sand, and sandstone are chiefly composed. It is the oxide of the element silicon, and is very abundant in the form of quartz. *Silicates* are salts of silica or silicic acid.

Silk. [AS., from L. *sericum*, silk.] Fine threads spun by silk-worms, but especially the *Bombyx mori*. The silk-worm was first kept in China for the purpose of manufacturing silk. From silk-worms' eggs, in about a fortnight, little caterpillars two inches long and light-colored come out; these must be fed with mulberry (*q.v.*) or lettuce leaves. In about a month the caterpillars

reach their full size, and inside their bodies is a sticky substance which they convert into silk. From two little holes in its head each caterpillar draws out flossy threads of the sticky matter, and twists them together by means of a gum, winding them round and round its body until it is enveloped in a ball of silk, called a *cocoon*, which is about as large as a grape or a pigeon's egg. The cocoons from which silk is to be obtained are heated in an oven, and the inner balls are thrown into warm water, so as to melt the gum; after which the silk from them is wound upon reels, and then made up into hanks. It is then known as *raw silk*. The thread of a single cocoon generally measures about 600 yards, but some cocoons have measured 1,200 yards. The silk fibre is sent to the factories, or silk-mills, as they are called, where it passes through the processes of winding, cleaning, twisting, weaving, dyeing, and finishing. Silk is made into silk for dresses, satin, velvet, ribbon, sarcenet, stockings, fringes, buttons, gloves.

Silk-worm. The worm which spins or produces silk threads. For thousands of years the Chinese would not allow the eggs of the silk-worm to go out of the country. About 550, two monks are said to have brought to Europe a few eggs hidden in their canes. Now it is quite domesticated, and has been so long fed by man that the female is nearly as motionless as if she had no wings, and the male merely flutters without leaving the ground.

Sil'ver. [AS.] A soft, white, shining metal which takes on a bright polish. It is found in combination as sulphurets and oxides, and with other metals. It is widely diffused. Of mineral ores associated only 1 in 17 is free from silver, and traces of it have been found in sea-water and in organic substances. Gold never occurs in nature apart from silver, and is also found with lead; yet there is a natural distinction between the veins of the several metals. The main sources of the world's supply, after the discovery of America, were Mexico and South America; but the United States on the Pacific slope now yields silver in excess of any other country.

Si'phon. [Gk.] A bent tube, with one arm longer than the other, for drawing off a liquid from one vessel to another at a lower level, the shorter arm being inserted in the liquid at the higher level.

Skate. [Scand.] A large flat fish more or less square in form, and the thinnest of ray fishes in proportion to its bulk. It is the largest of ray fishes. The European blue or gray skate is used as food, and sometimes weighs as much as 200 lbs. The American smooth or barn-door skate is also a large species, measuring often 3 feet across. Its nose is conical, and it has sharp spines above its eyes. Its jaws are covered with small, sharp-pointed teeth.

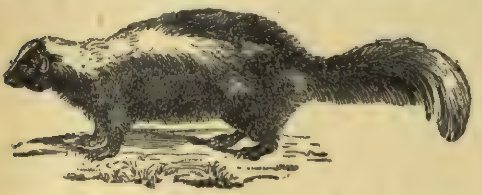
Skeleton. [Gk. *skeletos*, dried.] The bony framework of an animal body. That of the human body is composed of 246 separate bones. At the joints the bones are joined together by bands of a substance like gristle. The use of the skeleton is to form a foundation—a kind of stiff framework—on which the rest of the body can be built up. The bones of the head enclose and protect the brain; the bones of the trunk perform a similar office for the organs situated in the chest and the abdomen; the bones in the limbs impart rigidity to them, and aid us in performing work and in moving about. (See *Bone.*)

Skin. [Scand.] The natural covering of animals and plants. The thickness of the skin varies in different parts of the human body, from one-eighth to one-fourth of an inch. On the hands and feet it becomes thick (or callous), but in other parts it is thin and delicate, while at the ends of the fingers and toes it grows into thin plates called nails. The hairs are only portions of the skin grown very long and narrow. The skin is composed of *two layers:* there is a lower, thick layer, full of the fine blood-vessels called capillaries, and full, too, of nerves—this layer is called the *dermis;* upon it lies an upper, thin layer, of a horny or scaly nature, in which are *no* blood-vessels and *no* nerves—this is called the *epidermis.* Just under the dermis there is usually a layer of fat. When we examine the outside of our skin through a magnifying-glass, we can see great numbers of little holes or pores. No fewer than 5,000 pores have been counted in the skin forming the tip of a finger; and there are about 2½ millions of such pores in the skin of the whole body. Each pore is the end or opening of a tube called a sweat gland, which goes down, through the epidermis, into the dermis, where its lower end is coiled up into a little ball or knot. The oil glands are very similar to the sweat glands. Two are attached to each hair; and when the skin is in a healthy state this natural oil ought to be sufficient for the hair. The oily matter formed by these oil glands runs out on the skin and mixes with the sweat. The sweat produced by the skin of an ordinary man or woman every twenty-four hours measures not less than a pint and a quarter, weighing 1½ lb.

Skull. [Scand.] The bony case which encloses the brain, and with the bones of the face and mouth gives shape to the head. It is rounded on the top somewhat like the large end of an egg, and in front and on the sides it has openings for the eyes, the nose, and the ears. The skull is made up of compact plates, joined by irregular saw-like lines or projections called sutures. The upper jaw and the bones of the nose and cheeks belong to the skull, and are immovable. The use of having the skull in several parts is to allow the brain to grow, and to prevent a jar from affecting the whole skull. In many fishes the skull is almost wholly cartilaginous, with a layer of spongy bones.

Skunk. [Ind.] An animal of the Weasel family, found only in America. There are eighteen species, of which the common skunk is found in the rocky parts of North America. It defends itself by giving out liquid secreted in two glands near the anus, the scent of which is so nauseous and persistent that it forms an effectual defense against other animals. It is about the size of a

cat, with a broad body standing low on the legs. Its fur is coarse, the hair long, and the tail long and bushy. The claws on the fore feet are strong and suited for digging. It preys on mice and frogs. It does not run from its foes, its elevated white tail being a sufficient warning to all carnivorous animals, none of which will attack it. The common skunk is black, with white on the body and tail. The spotted skunk of Mexico is smaller, and is also marked with black and white. The skunk is hunted for its fur, which is in con-



siderable demand, but the hunter must be careful to avoid alarming the animal and causing it to discharge its obnoxious secretion.

Sky′lark. A bird which nests in the grass, but rises high in the air, singing as it rises. (See *Lark*.) The Australian skylark is a pipit, and though it rises it lacks the song of the true lark.

Slag. [Scand.] The dross of melted mineral, or cinders from a volcano.

Slate. [Fr.] A kind of rock which splits into thin layers very readily. The largest slate quarries in the world are in Wales. Welsh slates are lightest and best. They are used for covering roofs, for cisterns, for mantelpieces, and for writing upon. Slate is very useful for roofing purposes, since it is cheap, light, and impervious to water. Slates are fastened to the rafters with nails, and are placed so as to overlap one another.

Sling. [AS.] A strip of leather, having a cord attached to each end, for throwing stones by rapidly whirling round the head and suddenly letting one of the ends go; also a bandage hung from the neck to support the arm or hand.

Sloe. [AS.] A small bitter wild plum, the fruit of the blackthorn (*Prunus spinosa*); also the tree itself.

Sloop. [Du.] A one-masted ship with fore-and-aft sails. The typical sloop has a fixed bowsprit, top-mast, and standing rigging, but those of a cutter can be rapidly shifted.

Slot-machine. An ingenious instrument so arranged that its machinery is set in motion by the weight of a cent, a half-dime or other small coin. Slot-machines in great variety have been made, some adapted to set in action a weighing apparatus, others to drop out small articles, when the coin is dropped in. Among the latest devices is one to give out railroad tickets in exchange for the proper coin, used on the German railroads.

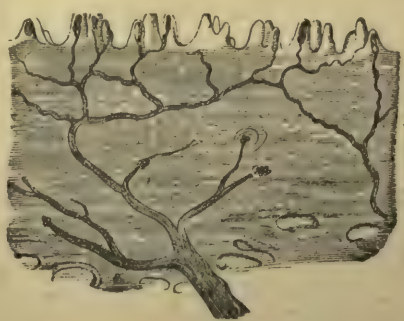
Sloth. [AS.] This is a curious creature without fore teeth and canines. It is a native of Central and South America. Its shape is very different from that of gnawing animals, for its front legs are longer than those behind. Some sloths have three, others two, large strong curved claws to each foot. The two-toed sloths have two toes on the fore foot and three on each hind foot. These the sloth hooks round the branch of a tree, and hanging with its back downward moves with great speed among the thick forests. Its strong coarse hair is so like the color of the trees that it is not easily seen among the branches; and there it has no enemies to fear except men and snakes. The natives of South America hunt it for its flesh, of which they are very fond. On the ground it moves with a slow, awkward shuffle, hooking its strong claws into the ground, and dragging itself along. When attacked it throws itself on its back, and tries to choke its enemy with its powerful arms. It lives on leaves and twigs, and completely strips one tree before it begins to strip another.

Slug. A land-dwelling mollusc, without a shell, except a small internal one which protects the heart. The slugs are the pests of gardens and cultivated places, and give much trouble to gardeners.

Sluice. [Old Fr., from *exclusa*, shut out.] A door or gate, sliding in a frame, for shutting off or regulating the flow of water; also a long box used in washing for gold.

Smelt. [AS.] A small salmonoid fish which ascends rivers to spawn, much esteemed for food. It has a peculiar odor.—*Candle fish* is a kind of smelt found on the North Pacific coast, and is so oily that it may be used as a candle by drawing a wick through it.

Snail. [AS.] A soft slimy land mollusc, usually protected by a spiral shell. Besides long tentacles tipped with black eye-specks, snails have a shorter pair, which are organs of smell. There are over 2,000 species of snails, and they are found in all parts of the world except the Arctic regions. Some are even smaller than a pin-head;



SECTION OF THE SKIN MAGNIFIED.

while others, in France and Italy, cultivated for food, are fairly large. The Great Vine Snail was considered a table luxury by the ancient Romans. Snails are vegetarians, and have jaws and tongues of saw-like edge, with thousands of rasping points on each. On the approach of cold weather the

snail throws a film over the mouth of its shell, which tightens like a drum-head. Snails have astonishing vitality. They regain activity after having been frozen in solid blocks of ice, and endure a degree of heat for weeks which daily crisps vegetation. In very dry weather they close up the shell as in cold weather, to retain the bodily moisture.

Snake. [AS. *snaca*, creeper.] A creeping reptile, whose gliding motion is due to having the vertebræ jointed with ball-and-socket joints. On each vertebra is a pair of ribs which are used as legs, working the snake backwards and forwards; and its scales are used as feet, catching the ground and pulling or pushing the whole body. Its jaws are joined by an elastic gristle, so that they can be spread wide; and its tongue darts far out beyond its lips, touching or feeling. Its teeth are not used for chewing but for holding and swallowing its prey. There are the black snake, blind snake, garter snake, green snake, ring snake, rock snake, milk snake, water snake, and dwarf snake, and various venomous snakes, such as the rattlesnake and the copperhead. The python is sometimes 30 feet long, and the female incubates her eggs. (See *Boa*, *Cobra*, *Rattlesnake*, *Serpent*.)—*Snake-bird* or *darter* is a kind of gannet with a snake-like neck.

Snap′ping-tur′tle. The common name of a family of reptiles, comprising turtles with the body high in front, low behind, large head, long neck, powerful jaws, tail long and strong. If assailed they raise themselves on their legs and tail, throw the body forcibly forward, and snap the jaws with great power upon their foe. They are a match for any enemy likely to attack them except man. They are frequently found upon the land near the water, devouring small animals. There are three species, two of which are American. They are hunted for their flesh, which makes a rich and palatable soup.

Snipe. The common name of a large family of birds, found in many parts of the world. The common snipes of Europe and America are much alike in size and plumage, being about 17 inches in total length, of which the bill is nearly 3 inches. They fly very swiftly and in a zigzag manner, and are difficult to shoot, though much hunted as a delicious game bird.

Snow. [AS.] Frozen moisture falling in soft white flakes. It is not produced, like hail, by the freezing of rain-drops, but formed by the direct passage of the vapor into the solid state. It falls to the earth in flakes, each flake consisting of a regularly shaped crystal, or, as more commonly happens, of several crystals grouped together. The most common form is that of six-pointed stars variously modified. Each star has a solid nucleus, from which six little rods of ice proceed at regular angles, and from the sides of these rods secondary rays may be given off, producing a countless variety of very beautiful figures. The snow-flakes are largest when the temperature is near the freezing-point, the snow being then soft and easily gathering into masses. The texture of snow being very loose, it is a bad conductor of heat; and being also a bad radiator on account of its white color, it forms an admirable covering for plants, shielding them from the effects of severe frosts.

Snow-bunting. An American bird, common in summer in the Arctic regions and in winter in the United States. It resembles the lark in its habits, and is generally very fat and much esteemed for the table.

Snow-drop. A small bulbous plant, with white dropping or hanging flowers, often appearing while the snow is on the ground.

SNOW CRYSTALS.

Snow-line. The line on a mountain above which snow never melts. The lowest limit of perpetual snow in the Alps is at 9,000 feet above sea-level, and in the Andes, at the equator, 16,000 feet.

Snow-shoe. A flat shoe worn to keep the foot from sinking in the snow. The frame of wood is three or four feet long and about a foot wide, with thongs or cords stretched across it, and having a support and holder for the foot.

Snuff. [Du.] Tobacco or stalks of tobacco finely powdered taken into the nose. It is scented with essential oils or otherwise. It was formerly much used, but is now very little.

Soap. [AS., akin to L. *sapo*.] A mixture of oil or fat with soda or potash for washing. Since the cheapening of caustic soda by the Le Blanc process, soda is chiefly used instead of potash as the alkali of soap. Common soap is a compound of fat or oils (*q.v.*) and caustic soda. Many kinds of soap are made, but they all consist of some fatty substance (as tallow) boiled with an alkali—either caustic soda or caustic potash. *Yellow soap* is made from tallow and caustic soda colored by rosin; *mottled soap*, from dripping, etc., boiled with caustic soda; *Castile soap*, from olive oil and caustic soda; *brown windsor*, from equal parts of tallow and olive oil boiled with caustic soda; *white* or *curd soap*, from tallow and caustic soda. *Transparent soap*, is made by dissolving curd soap in spirits of wine. *Marine soap*, is made from cocoa-nut oil and caustic soda; it will dissolve in salt water (which common soap will *not* do), and is therefore much used on board ships. *Soft soap* is made by boiling caustic potash with some fish-oil.—*Soapstone*, or *talc*, is a silicate of magnesia used to make stoves, hearths, crayons, etc.

So′da. [Ital.] A substance formerly got from sea-weeds, and in 1791 it was produced from common salt by Le Blanc. In this process salt is transformed into sodium sulphate by adding sulphuric acid; then by mixing with chalk and

coal it is made into sodium carbonate. Soda can be produced by electricity from brine. It is the most important of all chemical products used in the industries. *Caustic soda*, or sodium hydroxide, is used in making soap, wood pulp for paper, etc.; *cooking* or *washing soda* is sodium bicarbonate.

So′da-water. Water mixed with a little soda and carbonic acid; a beverage consisting of water highly charged with carbonic acid, to which fruit syrups are usually added.

So′dium. A common metallic element of the alkali group, always found combined, as in common salt. When isolated it is a soft, waxy white metal, so readily oxidized that it combines with water and must be preserved under petroleum. As a means of obtaining magnesium and aluminium, sodium is an important article of commerce. Its compounds are widely diffused in nature, and can be detected by the peculiar yellow color which they impart to a flame, or by the yellow line in the spectrum.

Soil. [Fr., from L. *solum*, ground.] Earth in which plants grow. Soil consists of a mixture of earthy materials resulting from the disintegration of the rocks by natural agencies, and a deposit of organic matter arising from the growth and decay of vegetation on the earth's surface. The influence of earth-worms, ants, and other small creatures on the condition of the soil has lately been shown to be considerable.

So′lan Goose. [Scand., *Sula*.] The gannet (*q.v.*).

So′lar Spec′trum. [L.] The spectrum of solar light, characterized by numerous dark lines, called *Fraunhofer lines*, from being observed by a German physicist of that name. [See *Spectrum*.]

So′lar Sys′tem. [L.] The sun, with the bodies revolving round it, and receiving from it their light and heat, and held by its attraction. It includes eight planets with twenty-two satellites, of which the Earth has one, Mars two, Jupiter five, Saturn nine, Uranus four, and Neptune one. There are more than four hundred asteroids, or very small planetary bodies, known between Mars and Jupiter. The meteoroids furnish the zodiacal light and the rings of Saturn. The year of Mercury is nearly 88 days; of Venus, nearly 225 days; of the Earth, over 365 days; of Mars, nearly 687 days; of Jupiter, nearly 4,333 days; of Saturn, over 10,759 days; of Uranus, nearly 30,687 days; of Neptune, over 60,181 days. The four outer planets are very much larger than the interior ones. There are many comets included within the solar system.

Sol′der. [Fr., from L. *solidus*.] Melted metal used for fastening pieces of metal together. *Hard solder*, for fusing at red heat, is composed of zinc and copper or silver and copper. *Soft solder*, for low temperature, in use among plumbers, consists of two parts lead and one part tin.

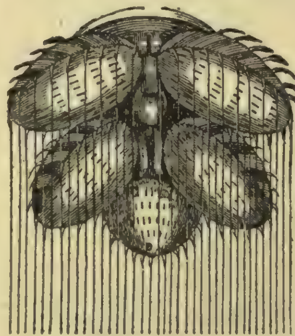
Sole. [L.] A kind of flat-fish of the genus *Solea*. The common sole of Europe is much used for food. Lemon or French sole is another species. The megrim is the British smooth sole or scald fish.

Sol′stice. [Fr., from L. *solstitium*.] The point in the ecliptic at which the sun is farthest from the equator, either north or south, and at which it seems to stand still. The 21st of June is the summer, and 21st of December the winter solstice; for some days before and after these dates the length of day is very similar. Both points are 23° 28′ from the equator.

Soot. [AS.] The loose black particles from smoke in chimneys disengaged from the fuel in process of combustion, consisting chiefly of carbon, and the result of imperfect combustion.

Sor′rel. [Fr.] A plant like the dock, whose leaves have a sour taste. *Mountain sorrel* has rounded kidney-formed leaves. *Red sorrel* is found in the West Indies, and the calyxes and capsules are used for making tarts and acid drinks. *Salt of sorrel* is binoxalate of potash, and is obtained from common sorrel or *Rumex acetosa*.

Sound. [Fr., from L. *sonare*.] That which can be heard. In physics, it is applied to the external cause which produces the sensation. In this sense the word *sound* stands either for the vibrations of the sounding body or for the impulses it has communicated to the air, and which immediately affect the ear. It can be shown by experiment that sound is the result of a vibratory movement which when sufficiently rapid produces a sound. A bell, a glass plate, a tuningfork, a piano string, if put into a state of vibration, will produce a sound if the vibrations take place in a suitable medium. It has been found that sound is not transmitted in a vacuum. A bell struck in the exhausted receiver of an air-pump is nearly inaudible. In water, sound travels nearly four times as fast as in air, in which its speed is about 1,093 feet per second. In solids the velocity varies widely. In inelastic substances like lead or wax it is small, while in those like wood and steel it is large. Musical sounds differ from one another in respect to *intensity*, *pitch*, and *character* or *timbre*. The intensity depends upon the amplitude of the vibrations. Pitch is the quality which distinguishes an acute sound from a grave one. It depends upon the frequency of vibration. As with other forms of wave motion, sound may be reflected and refracted; and if not in accord with each other their interference gives rise to beats.



SPINNERET OF SPIDER.

Soup. [Fr.] Water with meat or vegetables boiled in it and used for food. *Soup maigre* is made chiefly from vegetables or fish, with a little butter and a few condiments.

Sov′ereign. [Fr., from L. *supremus*.] A British gold coin worth twenty shillings.

Spade. [AS.] An instrument for digging, having a broad oblong and nearly rectangular flat blade, usually of iron, with a wooden handle.

Span′iels or Spanish Dogs. Handsome animals with long silky hair, drooping ears, bushy tails, and feet partly webbed. Water spaniels are good swimmers, and field-spaniels can fetch game. Blenheim and King Charles spaniels are lap-dogs.

Spank′er. [AS.] A fore-and-aft sail on the mizzen-mast attached to a boom and gaff.

Spar′row. [AS.] The Sparrow family is a numerous one of perching birds. They help the farmer by keeping down caterpillars, grubs, and insects, which would otherwise overrun the fruits and crops; but they are very combative and drive other birds away. The white-throated American sparrow has a black crown, yellow spots over the eyes, orange edges on the wings, and a white throat. It is called the peabody bird from the sound of its note. The English sparrow, introduced into the United States to destroy the caterpillars of the tussock moth, which are injurious to shade trees, has greatly multiplied and is the common bird of cities and towns. The hedge sparrow is the size of the robin, and belongs to a different family. Its beak is black and rather long and slender. The solitary sparrow is a species of thrush, and is a native of Southern Europe. It resembles the blackbird, and has bluish feathers. The Sparrow family includes finches, swallows, thrushes, and larks. (See *Beak.*)

Spar′row-hawk. A small hawk which preys on sparrows and other small birds. It is the most pernicious of hawks, feeding on pigeons, partridges and young fowls. It is bluish gray in color, with a cream-colored breast. It builds in hollow trees or in ruins. It is found in large numbers all over the world. It lays four or five eggs of a white color, spotted with red.

Spear. [AS.] A long shaft of wood, with a sharp iron point, used in fighting, hunting, or in catching fish.

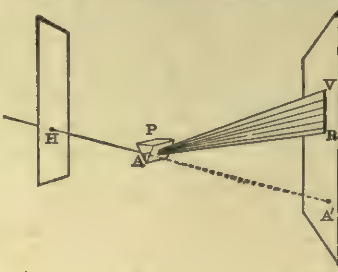
Spear-fish. A large, powerful fish found in the Mediterranean, related to and somewhat like the sword-fish. It has scales and ventral fins.

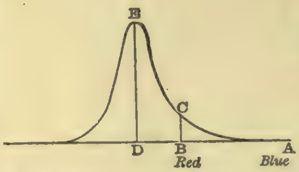
Specif′ic Heat. The quantity of heat required to raise the temperature of a pound of a substance one degree, taking as a unit of measure the freezing point quantity required to raise one pound of water at one degree. The specific heat of mercury is 0.033, that of water being 1.

Spec′tacles. [L.] Two glasses set in a light frame to help weak sight. They were invented by an Italian in the thirteenth century. For short-sighted eyes, spectacles with concave lenses are used, which form an image of the object nearer to the eye than the object itself. For long-sighted eyes, spectacles with convex lenses are used, which form the image at a greater distance from the eye than the object.

Spec′troscope. [L. *spectrum*; and Gk. *skopeo*, I see.] An instrument consisting of a telescope with a prism for separating the rays of light proceeding from the sun and stars or from burning substances, so that, by the relations of the lines to one another, the composition of the substances burned may be ascertained.

Spec′trum. A ray of light separated by a prism or otherwise into the colors of which it is composed. There are seven different bands of color —red, orange, yellow, green, blue, indigo, and violet. The spectrum of solar light or that of the light given off by burning bodies, is found to be crossed by very many dark lines or spaces where the light is interrupted. These are known from their discoverer, as the Fraunhofer lines. If the substance burned is a gas, its lines are bright instead of dark, and the rest of the spectrum is dark. Each substance makes a different set of lines, and *spectrum analysis* is a method of examining the lines in any ray of light and determining by them what substance yields the ray. By this means it has been found that many earthly substances exist in the sun, such as hydrogen, iron, sodium, etc. Similar substances have been found in very distant stars. Many of the nebulæ give a spectrum of bright lines, from which we conclude, that they are composed of luminous gaseous matter.





Spec′ulum. [L.] A piece of polished metal which acts like a mirror, as in a reflecting telescope. Silvered glass mirrors being lighter and more easily made, have taken the place of metallic mirrors.

Spermace′ti. [L. *sperma*, seed; and *cetus*, a whale.] A kind of fat from the head of the sperm whale used in making candles, ointments, and cosmetics. It is a semi-fluid substance which, on being taken from the animal, hardens as it cools. The large head is partly occupied by a cavity containing spermaceti, and other cavities throughout the body are also filled with it. It consists of salts of palmitic acid and ethal and hydrocarbon bases.

Sperm Oil. Oil got from the sperm whale. It is a thin and valuable oil, and, like spermaceti, is used in ointments and medicine. It is slightly pressed from the other matters with which it is mixed, and one animal has been known to yield 6,000 gallons of this oil.

Sperm Whale. A kind of whale called also cachalot, from which sperm oil and spermaceti are obtained. Sperm whales frequent tropical seas and live in groups or shoals. They have large, square heads, with a single blow-hole near the extremity of the snout. They have no whalebone plates in the mouth, but the lower jaw is furnished with large, conical, curved teeth, and

when the mouth is closed the teeth fit into cavities in the upper jaw. They sometimes grow to the length of 80 feet.

Sphere. [Fr., from Gk. *sphaira*, a ball.] A round body; also the apparent surface of the heavens, which is assumed to be spherical and everywhere equally distant, in which the heavenly bodies appear to have their places.

Sphinx. A fabulous monster of classic lore, with the head and bust of a woman, the body of a dog, wings of a bird, and tail of a serpent. The Egyptian sphinx was a winged lion with a human head and bust. This creature was carved in stone, and set up in rows as approaches to the great temples. The Great Sphinx, near the Pyramids of Egypt, is 62 feet high.

Spice. [Fr., from L. *species.*] A vegetable production, with a strong, sweet smell and sharp taste, used as a seasoning by mixing with food. The chief spices are ginger, cinnamon, nutmegs, cloves, allspice, and pepper (*q.v.*). Allspice or pinento is a native of Jamaica, and is an evergreen tree. The berries are dried and much used for flavoring, as they contain the flavor of other spices.

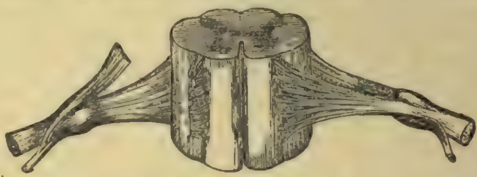
Spic′ules. Needle-shaped objects in sponges, which retain the shape of the sponge when the flesh is removed. Flints (*q.v.*) are filled with fossil spicules.

Spi′der. [AS., from *spin.*] An animal allied to the insects, which spins a web in order to catch flies for food. There are two divisions in the spider's body. The upper, or head part has a horny covering, and is united to the abdomen by a short stalk. Spiders have four pairs of legs, ending in hooks. Near the mouth are hooked teeth which have slits at the ends from which a poisonous fluid is ejected. There are eight eyes on the back of the head. Some spiders spin no web, but jump upon their prey; others, as the tarantula, run it down; but most snare their prey by traps in the form of exquisite webs. The webs of the house spider and cellar spider are woven in many shapes, but the garden spider weaves a geometrical web. At the end of the abdomen of the spider are from four to six spinnerets covered with tiny points, from each of which flows a gummy fluid which hardens into silk when it reaches the air. A web is fastened to an object by simply touching the spinneret with the object. Having arranged the long rays or spokes, a spiral thread is run round and round. Then a silken den to hide in is built near by, with one long thread by which she can feel if a fly strikes the net. Nearly all spiders enclose their eggs in a cocoon, which sometimes the mother carries on her back. Gossamer spiders send out long floating lines which carry them through the air. The water spider makes a bell-shaped cell under the water, and takes down a little bubble of air into the bell to supply it with air. The trap-door spider lives in warm countries, and has a nest in the ground lined with silk and covered with a lid made by layers of earth and alternate webs fixed to the nest to make a hinge. From the gossamer web of the garden spider are taken the fine threads which are stretched across the lens in the astronomical telescope for accurate sighting.

Spike. [L. *spica*, an ear of corn.] A piece of pointed iron or an ear of corn.—*Oil of spike* is a colorless or yellowish aromatic oil from broad-leaved lavender, used as varnish and as medicine.

Spin′ach. [Ital. from L. *spina*, a thorn, or *Hispania.*] A vegetable used for food, some varieties having thorny or prickly leaves, belonging to the Goosefoot family, grown in almost every country. It is (also) called *Spinage.*

Spi′nal Cord. A long, round mass of nervous matter situated in the cavity of the spinal column. The brain is a soft mass of gray and white nerve-matter, about three pounds in weight, which fills the interior of the skull. From it a cord of nerve substance, about as thick as the little



finger, and some eighteen inches in length, passes downwards from the brain along the centre of the backbone. This is called the spinal cord. Long but very fine nerves extend from the brain and the spinal cord to all parts of the body.

Spinning. [AS.] Drawing out and twisting fibres into threads. Long threads are spun by *mule* spinning-machines, which carry hundreds of spindles. The spindles are set and run swiftly in one long straight row on a wheeled frame, which backs off and returns with them all at once. Ring-spinning or warp-spinning is twisting the thread used for warp. As it is spun, it is wound on small bobbins and rewound on larger bobbins or spools, and then wound on large rollers the same width as the cloth to be made. It is then starched and dried before weaving into cloth.

Spitz Dog. A breed having erect ears and long silky hair, and called also Pomeranian.

Sponge. [Fr., from the Gk.] The animal occupying the lowest rank among the many celled animals, and next above the Protozoa, or single-celled animals. It consists of a network of horny or fibrous substance, or of lime or silica. This is covered and filled with a slimy flesh, through which run numbers of tubular passages. The sponge remains in the place to which it is attached under water, drawing in water and letting it out again, and feeding on the particles in the water. Coarse sponges are fished up with harpoons. Men dive for the fine sponges, and cut them off with knives, and the skeletons washed of their slimy flesh and dried are the sponges of commerce. The large bath-sponges come from the Mediterranean and the Bahamas. The zimocca comes from the Mediterranean. The yellow hard-head sponge is found in American waters on the Florida coast. It is dense, thick,

and hard. The finest, softest, and most delicate sponge is the Turkish toilet sponge, from the Red Sea, the Indian Ocean, and the Grecian Archipelago. Sponges are of all shapes and colors—like a vase, trumpet, globe, or branch of a tree. Neptune's cup is a curiously-shaped sponge. Venus's flower-basket is made of glassy threads. Sponges are useful for the bath, are made into a kind of cloth as a foundation of carpets and rugs, and are sometimes used to stuff cushions.

Spoon'bill. A long-legged wading bird akin to the heron, having a bill like a spoon. Its bill is wide and flattened at the tip, and it scoops up its prey. Like the heron it fishes, and like the duck it searches for worms in the mud. Its color in the first year is a dark chestnut, the second year it changes to red, and the third year to bright scarlet. The royal spoonbill of Australia is white, and the male has a crest.

Sprat. [Du.] A small fish somewhat like young herring or the pilchard. The sprat is marked by a deeply-serrated abdomen, while the young herring is without this. Sometimes called a garvie. (See *Whitebait.*)

Spring. [AS.] An outflow of water from the ground. The water of springs consists of rainwater which has soaked into the ground and percolated through the rocks, sometimes for a distance of several miles. Water easily passes through porous rocks, such as sandstone, but it cannot pass through clay. It then travels along the junction of two strata for a greater or less distance until it finds its way to an outlet and

INTERMITTENT SPRING

reappears at the surface as a spring. Springs of this simple character are very common, and are known as *surface springs. An Intermittent Spring* is one that flows and stops alternately being connected with a reservoir (*b*) by a sutured siphon (*a*). *Mineral springs* have mineral ingredients, which they hold in solution.

Spring'bok. [Du.] A South African gazelle, noted for its swiftness, springing action, and graceful form. It has a white stripe on the back and tail.

Spring-tide. The highest tide at or soon after new and full moon. It rises higher than the average tide. (See *Tides.*)

Spruce fir. [From *Prussia.*] A kind of fir, but unlike firs in having pendent cones with persistent scales and leaves arranged round the shoots. The sprouts are used to flavor spruce beer and the wood is used for fences, boat building, cooperage, etc. There are many varieties in Norway and the north-west of America. Frequently seen in parks.

SQIRREL.

Square. [Fr., from Ital.] Having four equal sides and four right angles. In *carpentry*, the square has at least one right angle and two or more straight edges. It includes a carpenter's square, L, a T square, and a try square ⊿.

Squash. The fruit of a species of the gourd plant, to which the pumpkin and melon also belong. It was grown in America by the Indians before the whites came; also in Europe in early times. It is smaller than the pumpkin, the chief kinds being the round flat ones with scalloped edges and the long crook necks. An English variety is the vegetable marrow or egg-squash. It is much used in New England in pies, and is a common table vegetable throughout the United States.

Squid. Any one of numerous species of cephalopods with ten arms, a long, tapering body, and a caudal fin on each side. The squid is abundant in the North Atlantic, and is used as bait in cod-fishing. It is also known as calamary, and has a sac of ink-like fluid, which it discharges from a siphon tube to hide it from its foes. (See *Sepia.*)

Squir'rel. [Low L., from Gk.] A beautiful little gnawing animal, of different colors and sizes, found in all parts of the world except Australia. The tail is not only the squirrel's greatest ornament, but is of the utmost use to it in leaping. The hairs stretch out on both sides like a fan, and serve to guide the animal. The flying-squirrel is so called from its having a skin, as thin as paper, but covered with fur, stretching between the front and hind legs, which makes a kind of wing, with which it can jump from tree to tree. It is found in Java, India, America, and Siberia. The common red squirrel lives among trees, building a round nest at the top of a very high tree. It eats nuts, acorns, and corn, and

lays up a store of food for use in winter and spring. Its hind legs are longer than its front ones, between which it holds its food. The chipmunk or ground squirrel is so called because, though it can climb trees very well, it does not live in them, but makes its nest in burrows deep under the ground. It has large cheek-pouches, in which it carries its food to its underground store-houses. It is a beautiful striped animal, and is common in North America, where it is also called the chipping squirrel.

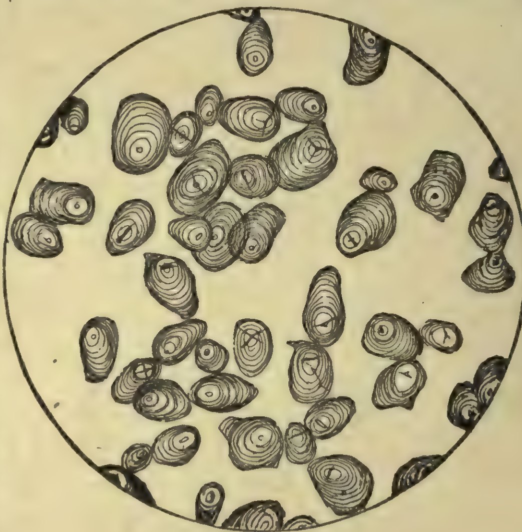
Stag. [Scand.] The male of the red deer of Europe. Its horns are long and branching, and when of full growth will often weigh twenty-four pounds. When the horns carry twelve points or tines the stag is a *royal* one. There are antlers in existence with many more points than this, one in Saxony having 66 points.

Stalac'tite. [Gk., to drop.] A stalk of lime hanging from a limestone cave. It is due to water carrying lime which makes its way through the cave roof, and evaporates, leaving the lime hanging like an icicle. *Stalagmite* is the stalk of lime on the floor of the cave which has dropped in water from the roof.

Sta'men. [L., a thread.] One of the thread-like pollen-bearing stalks in the centre of a flower.

Star. [AS.] One of the bright bodies seen in the sky at night, whose distance is so great that as seen from the earth they appear only as points of light. By astronomers the stars are looked upon as the suns of remote systems. Like our sun, they emit light; and when the spectroscope is applied to the light which they give out, it is found that the materials of which the stars are composed agree with those known to be present in the sun and in our earth. The distance of the stars is so great that when viewed from the earth they are always seen in the same direction; hence, as they maintain an invariable position relative to each other, they have been named *fixed stars*. This term is used in a comparative and not an absolute sense, as it is known that many of them are in a state of motion, although it can be perceived only by delicate observations. They are divided into classes, according to their apparent brightness. These are termed magnitudes. The brightest stars are said to be of the first magnitude, those that fall short of this of the second, and so on. Down to the sixth or seventh magnitude the stars are visible to the naked eye, and from the eighth to the sixteenth by powerful telescopes. The three or four brightest classes are distributed with tolerable uniformity over the celestial sphere; but of the total amount visible to the naked eye and by means of the telescope, by far the larger number are in or near the Milky Way. In certain parts of the heavens the stars are collected into groups in a more condensed manner than in neighboring parts. Such groups are called *clusters*. One well-known group is called the Pleiades, in which six or seven stars may be noticed by the naked eye, but which photography has shown to consist of 2,326. Many nebulæ that were formerly thought to be masses of glowing gas have been recently found to be clusters of stars so remote that their individual members are imperceptible except with instruments of great power. Photography has revealed stars so far distant that a message sent 1,900 years ago would only have just reached them, and would be still on the way to others, going with the speed of light, or 186,000 miles a second.

Starch. [AS.] One of the main constituents of plants. It is composed of carbon, oxygen, and hydrogen, the last two in the proportions required to form water. It is near to sugar in chemical composition and is converted into it in the life history of the plant. Wood fibre belongs



POTATO STARCH CORPUSCLES.

to the same class of compounds. These make up the great bulk of the plant, the remainder being its oily matter and its nitrogenous substance, which forms the protoplasm of its cells. Starch for commercial use is chiefly obtained from wheat, maize, rice, and potatoes; and in France from horse chestnuts. Starch in maize is from 60 to 80 per cent.; wheat, 60; rye, 60; oats, 46; barley, 57; rice, 61; potatoes, 61. Starch is found in the form of little grains contained in the cells of plants. It is insoluble in cold water; but in hot water the grains swell up until they burst and form a jelly-like mass. Corn starch is made in the United States by soaking Indian corn in water containing caustic soda and hydrochloric acid to dissolve the gluten, grinding, washing on sieves, and finishing by various processes. Rice starch is largely made in England, France, and Belgium. Starch is useful for stiffening cloths, sizing paper, making paste, dextrine, glucose, detecting iodine, and as an article of food. (See *Rice*, *Sago*.)

Star-fish. A star-shaped sea animal which creeps over rocks and sand, feeding on mussels and shellfish. The five rays are made of limestone plates, joined by a tough membrane. Under each ray

is a groove with hundreds of tiny transparent tubes moving separately. The tubes act as feet and carry the animal forward. When the star-fish feeds, it not only bends its rays into a cup shape to hold its prey, but numerous tiny suckers spring up to help. Star-fishes have a liver and intestines, and these organs extend into the five rays. They have nerves which end in a red eye-speck at the end of each ray. They do great damage to oyster beds, as they eat the oysters, which they force to open their shells. They are dredged from the beds and used as manure.

Star′ling. [AS.] A small greenish-black British song-bird, which can be taught to whistle tunes and sometimes to speak a few words. It builds in church steeples, in ruins, or on rocks. The food of the starling consists of insects, caterpillars, worms, and snails; but it also feeds on grain, fruits, and seeds. In severe winters it frequents the sea-shore, but in summer it is found in the farmers' garden, where it makes harsh cries and chattering sounds before retiring to rest. In America, bobolinks, cow-birds, meadow-larks, orioles, and red-winged blackbirds are all starlings. The bobolink is black and white. The oriole is called a hanging bird because of its peculiar nest, which is like a pouch or pocket.

Steam. [AS.] Water in the gaseous state. The clouds of vapor which are seen to issue from a kettle of boiling water are also popularly called "steam;" but these white clouds consist chiefly of condensed steam, and do not possess the properties which belong to steam considered as a gas. Dry steam is as much invisible as atmospheric air. Owing to the great pressure which it exerts, to the large amount of heat which it can carry, and to the ease with which it can be condensed, steam has been found better fitted than any other gas for use in engines employed for the production of mechanical work.

Steam-engine. An engine worked by steam. The chief parts are the piston, cylinder, and valve gear. The piston works in a cylinder, to which steam is admitted by the action of the valve gear, causing the piston to move backward and forward and communicate motion to the machinery. The atmospheric engine constructed by Newcomen near the beginning of the eighteenth century was the first in which a beam was made to oscillate by the elastic force of steam. It was used for pumping water out of mines. The condensation of the steam in the space below the piston produced a vacuum, and the piston was forced down by the pressure of the atmosphere. One of Watt's first improvements was the introduction of a separate chamber for the condensation of the steam. Another improvement introduced by Watt was *double action*. By this arrangement the steam was introduced alternately above and below the piston. This consisted in cutting off the steam from the boiler before the piston had reached the top of the cylinder. It need scarcely be said that many later improvements have been introduced in the steam-engine, greatly increasing its powers.

Steam-turbine. A new form of steam motor, in which the steam is thrown against the valves of a turbine-wheel, which it causes to turn with great rapidity. These machines develop great power in small space. They have been placed in torpedo boats, driving them through the water at the unequaled speed of over 35 knots an hour.

Ste′arin. [Gk. *stear*, tallow.] A constituent of animal fats, as beef and mutton suet; and some vegetable fats as of cocoa. It is remarkable for its solidity, and raises the melting-point of fat. It is prepared by mixing ether with suet, and is used in making soap.

Steel. [AS.] A hard metal made by heating iron with charcoal. Steel is the form of iron in which the amount of carbon is intermediate between that contained in cast iron and in wrought iron. In steel, the carbon is either chemically united with the metal or dissolved in it. It may contain silicon and manganese in small quantities, but sulphur or phosphorus is regarded as an impurity. It is malleable and ductile, fusible, and capable of acquiring, by being tempered, great hardness, which renders it suitable for cutlery and the different varieties of cutting tools. Steel was at one time always prepared from wrought iron by heating the bars for some time in contact with charcoal. This method of preparation is known as *cementation*. The process of manufacturing steel known as the Bessemer or pneumatic process is of very great industrial importance. It consists in blowing air through molten pig iron in a vessel called the converter. The carbon and the silicon which the pig iron contains are thus oxidized, and the iron is brought to the condition of wrought iron. After the iron is completely deprived of carbon, a certain quantity of pure cast iron is added in order to supply the carbon necessary to convert it into steel. The metal is then cast into ingots. This kind of steel is used for railway axles and rails, for boiler plates, and for ships. Large buildings, as churches, colleges, and schools, are now made with frame-work of steel. The walls are double, and the air between acts as a non-conductor of heat.

Sten′cil. A thin plate of metal or other material with letters or a pattern cut through it. It is laid flat on a surface, a brush dipped in paint or ink rubbed over it, and the letters or pattern thus transferred. Stencils are much used by merchants to mark boxes or barrels.

Steppe. The vast, low plains of Europe and Asia, extending from Holland to Russia and thence through Siberia and Mongolia. The name is specially applied to the broad and largely arid pasture lands north and east of the Caspian, and the Siberian lowlands.

Ste′reoscope. [Gk.] An optical instrument of magnifying-glasses, with a slide for two slightly different pictures of the same thing, which when looked through throws both pictures into one, and gives the figures the appearance of solidity.

Ste′reotype. [Gk.] A metal plate, being an exact copy in a solid form of a page of type. Stereotyping by plaster of Paris was discovered by Ged in the eighteenth century. Electrotypes

have now taken the place of stereotypes in book-work. In newspaper offices, where speed is important, the paper process of stereotyping is still much used. In this process the type is placed under a press, and a matrix is made of damp paper by forcing the type into the paper. After the paper is dry type-metal is poured over it, and the metal plates are trimmed and planed.

Steth′oscope. [Gk.] A medical tube used for listening to the beating of the heart or the sound of the lungs in breathing.

Stick′leback. [AS.] A very small fish with two or more prickles on its back. It builds a nest somewhat like that of a bird. The male gathers weeds and erects a barrel-shaped house. He secretes in his body a sticky slime, which as soon as it touches water grows firm and hard, and with this he cements the nest. There is a hole right through the nest, so that the water flows over the eggs. In times of danger the father opens his mouth, and the whole swarm of young fishes rush in for protection. Sticklebacks inhabit both salt and brackish water.

Sting. [AS.] The sharp point with which bees, wasps, etc., defend themselves. The sting of a female bee is a dart with barbs at the end of the abdomen connected with a poison gland; and the sting is sometimes used in different bees for boring, cutting, and sawing holes in which to place the eggs. Male bees have no stings, and are harmless. When the bee leaves the sting in the wound it dies. The wasp saves her sting after inflicting a wound. The sting-ray has one or more large sharp barbed dorsal spines on its whip-like tail. The stings of nettles are hairs with a poisonous secretion.

Stone. [AS.] A piece of rock, or the hard centre of fleshy fruits. *Building stones* are natural or artificial. Natural stones are chiefly granite, marble, limestones, sandstones, and also slates. The hard stones are generally got by blasting, others by channeling and wedging, while the more fragile are sawn out in the quarries. Large masses of stone are called *rock*, smaller pieces *stone*, and finer pieces *gravel*, or still finer *grains of sand*. *Precious stones* include diamonds (*q.v.*), emeralds and beryls, sapphires (*q. v.*), and rubies (*q. v.*), amethysts, serpentine, malachite (*q. v.*), turquoise, jasper, jade, and chalcedony.

Stone-age. The era of primitive man, when his only tools and weapons were made of stone. In the *old stone-age* rudely chipped stone implements were used; in the *new stone-age* the implements were smoothed and polished. Great numbers of these stone utensils have been found, in all parts of the earth. The stone-age was followed by the bronze-age, and that by the iron-age.

Stone′ware. A coarse stuff used by potters, and the vessels of it glazed and baked.

Stork. [AS.] A wading bird of the family Ciconidæ, nearly allied to the heron, with long slender legs and rather thick neck. The bill is as long as the head, and tapers to a point. In Holland, storks give up their aquatic habits and nest on tall trees, towers, or chimneys. Sometimes frames or false chimneys are made on the tops of houses for storks to build on. The nest is built of sticks and dry grass, and there are three or four bluish-white eggs, which take thirty days to hatch. The storks feed on garbage, snakes, frogs, rats, mice, and vermin. In winter they migrate to warmer regions. Before starting on their flight they assemble in large flocks of two or three thousand, and the common belief is that they consult as to their journey. When they return to Holland in spring, they are welcomed as harbingers of that season. The white stork is found in Europe; the black stork in Europe, Asia, and Africa; the black-necked stork is the East Indian jabiru.

Stove. [Du.] A kind of box, generally made of iron, which stands in some part of the room, supplied with fuel from time to time through a door. Stoves are more economical than grates, since less of the heat produced goes up the chimney, but they are not so healthful. Anthracite requires a stove with a base burner, that causes a smaller draft of air, much in use in the United States. Oil and gas stoves are much in use for heating, and gas stoves are coming into large use for cooking purposes.

Straw. [AS.] The stalks or stems of wheat, rye, and other cereal grasses, after the grain has been thrashed. It is woven into hats, and made into boards and paper. Chip hats are not made out of straw, but from splints of Lombardy poplar.

Straw′berry. A widely cultivated perennial plant, having a red, small berry, with delicious taste. In cultivation its runners spread along the ground. The flowers have five petals, and are mostly white, seated on a convex receptacle, which enlarges in the fruiting season, and becomes pulpy and edible; so that what is popularly called the fruit is only the end of the flower stem greatly altered, and bearing the real fruit in the ripened ovaries over its surface, or sunk in the succulent mass. There are many varieties. *Fragaria vesca* is the European kind, and *Fragaria Virginica* the American. The fruit has been enormously increased in size by cultivation.

Strych′nine. [L., from Gk. *strychnos*, nightshade.] A strong poison got from the seeds of nux vomica. It is obtained as a white crystalline substance, and has a bitter, acrid taste. It is insoluble in water, but dissolves in alcohol. In medicine it is used as a stimulant for the nerves.

Stuc′co. [Ital., from a Ger. root of *stück*, a piece.] A kind of plaster made of lime, sand, and finely-crushed marble, for ornamenting walls.

Stur′geon. [Old Fr.] A long, narrow fresh-water fish, the roe of which is made into caviare, and the air-bladder into isinglass. It has free gills, and its body is more or less covered with bony plates, in five longitudinal rows. The tail is heterocercal, having the vertebræ continued into the upper lobe, which is longer than the lower one, and the skeleton cartilaginous. It runs up rivers to spawn. The eggs sometimes make up nearly one-third of the fish, and there are over three million in one female. Sturgeons are

found in Europe and America, and in one season 200 tons of caviare have been made on the Caspian. It is now made largely on the Delaware.

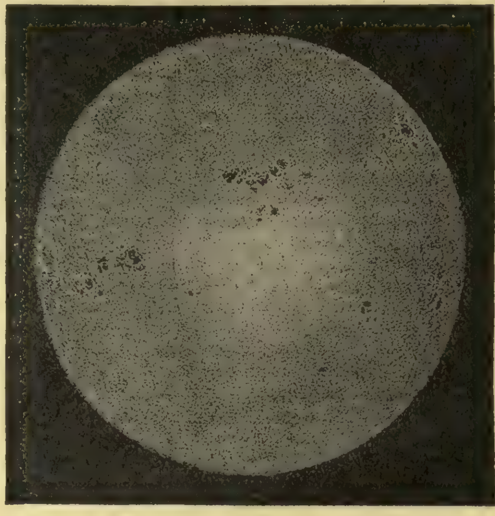
Suck′er. A fish of the carp family, many kinds of which are found in the rivers and lakes of the United States. It has no teeth, its lips being formed for sucking. It is found in the rivers in early spring, and is caught in dip-nets. The *buffalo sucker* of the Mississippi is sometimes more than a yard long.

Sug′ar. [Fr. from Arab.] The sweet juice of the sugar-cane and other plants pressed out and dried. It is soluble in water, generally crystallizable, neutral to vegetable colors, and is an organic chemical compound of carbon, hydrogen and oxygen. There are two distinct sugars—saccharoses or sucroses, and glucoses (*q. v.*) or amyloids. The saccharoses include cane-sugar, beet, palm, sorghum, and maple sugar. The first two yield nearly the whole sugar-crop of the world. The cane-sugar comes from the tropics, that of the beetroot from the north temperate zone, very largely from Germany. After sugar is boiled and strained and purified by adding lime, and filtering through cotton and charcoal, it is poured into molds, and when cool forms loaf-sugar. The liquid which remains after the sugar crystallizes, is called molasses, it being a dark, sweet, sticky liquid, much used in cooking. Glucose or grape-sugar is made from starch by the action of heat and acids. Much of it is produced from maize, being largely sold as the glucose sirup.

Sul′phur. [L.] A yellow mineral, occurring in large quantities either as pyrites (sulphides), gypsum (sulphates), or native, mixed with gypsum. It is found in volcanic regions. It is purified by distillation, and is obtained by sublimation as a lemon-yellow powder (flowers of sulphur) or as sticks (brimstone). It burns with a blue flame and a peculiar irritating odor. It is used in gunpowder, and in making matches, in medicine, and in making sulphuric acid. Sulphur is also obtained as crystals.—*Sulphuric acid*, the most important compound of sulphur and oxygen, is a heavy, corrosive oily liquid, colorless when pure, but usually of a brownish color. It is used in the manufacture of hydrochloric and nitric acids, alizarin, soda, and bleaching-powders; in making ether, parchment, and nitro-glycerine, and in etching iron. It was formerly called vitriolic acid, and is popularly called *vitriol* or oil of vitriol. (See *Epsom Salts*.)

Su′mach. A genus of small trees and shrubs, having numerous species, found in all parts of the world except Australia and the polar regions. The leaves of a kind grown in America are used by the Indians for tobacco. The seeds of another kind yield Japan wax or varnish. Chinese galls come from another species, and are largely used in tanning and dyeing. There are twelve kinds in the United States, and two of them are poisonous. These are the poison ivy and the swamp sumach, which cause a skin eruption, attended with violent itching. The Virginian or stag's-horn sumach is a common American species. The leaves are pinnate, the flowers in a crowded panicle, and the fruit globular, covered with hairs. Their scarlet leaves in autumn are conspicuous forest ornaments in America.

Sun. [AS.] The body in the heavens that gives light and heat, and round which the earth and planets revolve. (See *Solar System*.) It is about



92½ million miles distant from the earth, and its diameter is about 860,000 miles. It revolves on its own axis once in 25½ days. Its luminous surface is called the photosphere, above which is an envelope largely of hydrogen, called the chromosphere, visible through the spectroscope, or at the time of a total solar eclipse. Above the chromosphere, and extending for millions of miles, are rays of light called the corona. Dark spots appear on the sun's disc, and consist commonly of a black central portion with a surrounding border of lighter shade. These change in their size from points to spaces 50,000 miles in diameter. It has been established that a maximum and a minimum number of sun spots occur in periods of 11 years. The sun is not a fixed body, round which the earth and other planets circulate, but it, with all the planets, has a motion through space. In regard to *physical structure*, the sun is believed to be a mass of incandescent (glowing hot) gases, the temperature of which is so high that none of the chemical elements entering into its composition can exist in any other than the gaseous state. The quantity of heat given off by the sun is enormous. There are several theories as to its origin, the most probable being that it is due to a gradual shrinkage of the sun's mass which reduces its power of containing heat.

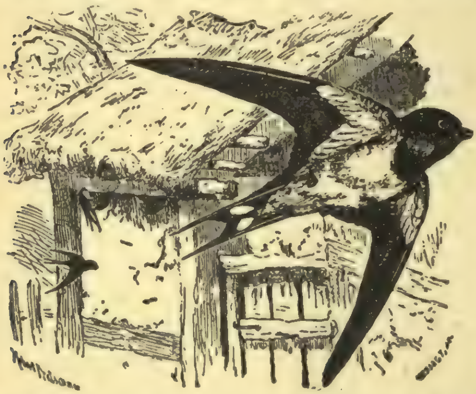
Sun-dial. An apparatus in common use as a timekeeper when clocks and watches were scarce and costly. It consisted of an upright style whose

shadow was thrown by the sun on a plate of metal. As the day went on the shadow moved over the marks on the dial, indicating the hours and their divisions.

Sun-fish. A genus of fishes with short, rounded, and flattened bodies. There are small species in many streams, and the great sunfish of the Atlantic grows to the length of 4 feet and the weight of over 500 pounds.

Sunflower. A tall plant, a native of America, having large marginal ray flowers with yellow rings. The seeds are used as food for cattle and poultry, and yield an excellent oil. The flowers abound in honey, and the leaves are useful as fodder. One of the tuberous species is the Jerusalem artichoke.

Swal′low. [AS.] A small bird, with small legs and weak feet, but with long, pointed wings and a forked tail, which are both favorable to swift flying. It flies at a rate of from 60 to 90 miles an hour, and delights in circling round places where insects abound, upon which it feeds. The



house-martin or town swallow fixes its mud nest under the eaves of houses. The sand-martin with its tiny beak bores holes in sandstone rocks, where it makes its nest at the farthest extremity with loose hay and a few goose feathers. There are a number of American species, a common one being the barn-swallow. The nest of the esculent swallow, which inhabits Ceylon and Sumatra, is much valued by the Chinese. It consists of seaweed, which the birds swallow and mix with their saliva, and then deposit in layers round their nests, and the whole is hardened by the air. The nests are glued on rocks or inside caverns, near the sea-shore. When boiled, these nests, which are in reality a fine gelatine, yield a good quality of glue or jelly, which is made into soup. (See *Swift.*)

Swan. [AS.] The largest and most graceful of all swimming birds. When full-grown its feathers are white, but when young they are bluish-gray. Its feathers are thick and oily, and cast off water. Its feet are webbed, and it swims rapidly. Its legs are placed far back, and this gives it a waddling walk. Its neck is longer than its legs, and so it can reach its food. It feeds on roots and seeds of water-plants, and is fond of worms, small fishes, and snails. Its nest is built of grass and reeds on the banks of rivers or lakes. The swan is found all over the world, and being beautiful on the water, is when tame kept on ponds and ornamental waters. The black swan of Australia has a red bill crossed with a white band. The South American black-necked swan has a bright rose-colored double knob on its bill.

Sweet-bread. Part of the inside of an animal, with a sweet taste and a likeness to bread, used as food. The thymus gland is called neck or throat sweet-bread, and the pancreas the belly sweet-bread.

Sweet Flag. A kind of reed which flourishes along the banks of rivers or grows in swamps and ponds. It is found in the cooler sections of Europe and North America, also in some parts of Asia. Confectioners use its roots, which have a strong smell and a biting taste, in making some kinds of candy.

Sweet-pea. An annual plant, *Lathyrus odoratus*, or its many-colored sweet-scented blossoms.

Sweet-potato. A plant which is not allied to the white potato, but belongs to the morning-glory family. It is a creeping vine, bearing long root tubers of sweet taste. It was probably of American origin, but is now widely cultivated. Many tropical varieties are known as yams. It needs a warmer climate than the Irish potato, and does not do well in Europe, but is widely grown in the United States, many millions of bushels being raised annually.

Sweet-will′iam. A kind of pink of many different colors and varieties.

Swift. [AS.] A quickly-flying bird of the Swallow family. Its form and habits resemble those of the swallow. It has a shorter bill, but it has no complex vocal muscles. It nests in church steeples and under the tiles of roofs, and screams shrilly. The Australian and American swifts have rigid tips to the tail feathers. The American chimney-swallow is a swift which has acquired the habit of building in chimneys, fastening its nest, which is made of small twigs, to the wall by a strongly adhesive secretion. This glue is spread over the whole nest, and becomes very hard.

Sword-fish. A large fish with the upper jaw long and pointed like a sword, which pierces four or five inches of solid wood. Its dorsal fin is high, and ventral fins are absent. It swims very fast, and is one of the deadliest enemies of the whale, which protects itself by diving to the bottom of the sea, whither the sword-fish cannot follow. It is plentiful on the coasts of Massachusetts, where it is caught by the harpoon, and its flesh, though coarse, is eaten.

Syc′amore. [Gk.] A kind of fig-tree in Egypt and Syria; the great maple in Europe and the plane tree in America.

Syr′inge. [Gk.] A tube fitted with a piston for sucking up and squirting out water and other liquids, used for injecting them into wounds or openings of the animal body, or in gardens for throwing liquids upon plants.

T

Tack. [Celt.] A small nail with a broad, flat head; also the direction of a ship in regard to the trim of her sails—the starboard tack when close hauled with the wind on her starboard side, the port tack when on the port side. In tacking or changing the direction, a vessel is brought to point at first directly to windward, and then so that the wind will blow against the other side.

Tack′le. [Scand.] Ropes and pulleys for lifting weights. *Ground-tackle* are anchors, cables, etc.; *gun-tackle*, the apparatus for hoisting cannon.

Tad′pole. A frog (*q. v.*) in its youngest state. In this stage it breathes by means of external or internal gills, and has a fin-like tail.

Tail. [AS.] The long flexible part of an animal that terminates its body behind. It contains a series of movable vertebræ, and is covered with flesh and hairs or scales. The tail of birds consists of fused vertebræ; the tail of fishes ends in a caudal fin. Woodpeckers climb and rest on the stems of trees with their tail feathers.

Tail′or-bird. An Asiatic or East Indian bird that makes its nest by sewing together the leaves of trees, and in doing so uses its beak and claws instead of a needle.

Tal′low. [AS. or Scand. *talg*.] The fat of animals of the ox or sheep kind. Its solidity is due to the large amount of stearin it contains. It is used to make candles (*q. v.*).—The *Tallow-tree* grows in China, and produces from its seeds a substance resembling tallow.

Tam′arind. [Arab.] A lofty, wide-spreading tree in the Indies, with flowers in racemes, pinnate leaves, and pods abounding in acid pulp of cooling and laxative qualities. West Indian tamarinds are preserved in sirup, but East Indian fruits are put up without sirup.

Tam′arisk. [L. *tamariscus*.] A tree or shrub

TAPIR.

with small scale-like leaves and clusters of white or pink flowers. Its bark is used as an astringent, and the ashes of the plant yield sulphate of soda.

Tam′bourine. A musical instrument consisting of a piece of parchment stretched on the top of a hoop, furnished with little bells. In play it is struck by the hand or elbow, and the bells jingled.

Tan′ager. A group of American birds conspicuous for their brilliant colors. They represent the finches of Europe and Asia. The most beautiful of them, the scarlet tanager, comes from Mexico to the United States in April, its range extending to Canada. The male is of a bright scarlet.

Tandem. A Latin word meaning at length. Ap-

plied to horses driven one in front of the other. A bicycle carrying two, three or four persons.

Tan′nic A′cid. Acid derived from *tannin*, which is the astringent principle of oak-bark or gall-nuts, and is used in tanning and as an astringent. It is the basis of common ink. It is sometimes used to describe all astringent substances in the vegetable kingdom—in willow, tea, coffee, etc.

Tan′ning. [Fr. *tanner*, from Armorican *tann*, oak-bark.] The turning of skins into leather (*q. v.*) by steeping in water mixed with oak-bark.

Tape. [AS., from L. *tapete*, cloth for hangings.] A narrow woven band used for tying and binding.—*Tape-worm*, a long, flat, parasitical worm, with small head, no mouth, but having suckers and sometimes hooks for adhesion to the walls of the intestines. The pork thread-worm from pigs, the beef tape-worm from young cattle, and the broad tape-worm are parasites of man.

Tap′estry. [Fr. *tapisserie*.] Cloth of wool and silk, covered with woven or sewed figures, for hanging on walls. Tapestry carpet resembles Brussels carpet in having the colors of the warp printed before weaving.

Tapio′ca. [Braz.] A granular substance got by heating the manioc root. The manioc or cassava root is bitter, and has a poisonous sap, which by grating, pressing, and baking is lost. It is grown in the West Indies and in Africa. Tapioca is much used in puddings and as a thickening for soups.

Ta′pir. [Braz.] An animal with a thick skin, short ears, short neck, and long prehensile upper lip. It is between three and four feet high and from five to six feet long, and in general form reminds us of the hog. The tapir has three toes on the hind feet and four toes on the fore feet, but the outermost toe is of very little use. Its long nose is like a rudiment of the elephant's

trunk. There are two kinds of tapirs: one, a native of South America, is of a dusky-brown color; the other lives in Sumatra and Java, and is black, with a broad white band across the body. Tapirs are harmless, gentle creatures, but they can give a severe bite with their big teeth when attacked. They have great strength and can force their way through the thick underwood of tropical forests to the water, of which they are very fond.

Tar. [AS.] A black, sticky liquid, distilled from pine trees and from coal. When charcoal is produced, an arrangement is made for collecting tar. From wood-tar is distilled wood-vinegar or pyroligneau acid, from which is produced wood-naphtha. Wood-tar is got from the Scotch fir, the Siberian larch, and other fir-tree roots. Coal-tar is a product in making gas, and yields crude naphtha and pitch. Mixed with wood-naphtha, crude naphtha is a solvent of resins. Benzole, carbolic acid, and aniline colors are all obtained from coal-tar. (See *Coal-tar.*)

Taran′tula. A poisonous spider found near Tarentum, in South Italy; others are found in Texas. (See *Spider.*)

Tare. [O.E.] The vetch or tare somewhat resembles the pea. The "winter" vetch is sown in autumn, and is cut in May; spring vetches are sown in February. The vetch likes clayey or marly soil, and is cut little by little as fodder for cattle and horses, or sheep are penned upon it. The winter vetch is useful, as it comes when other forage is scarce.

Tarpau′lin or **Tarpau′ling.** A piece of coarse canvas covered with tar to keep out wet.

Tar′tan. Woolen cloth woven in stripes or checks, formerly much worn by Scottish Highlanders, whose clans were known by the different-colored tartans. *Trews* are trousers made of tartans.

Tea. [Chin.] The leaves of the tea-plant. The tea-plant, chiefly cultivated in China and in Assam, is a low bushy shrub, bearing a small white flower, and having leaves with saw-like edges, like those of the rose. Either black or green tea can be made from the leaves of the same plant. For *black* tea, the leaves are picked and exposed to the air in large heaps for one or two days. They are then placed on tables, and rolled by hand, and then dried or roasted in large iron pans, when their color changes to a dark, almost black, hue. For *green* tea, the leaves are dried almost as soon as picked, when they preserve much of their natural color. The dried leaves of the tea-plant contain a white crystalline substance called *thein.* When boiling water is poured on the leaves, thein, or the active principle of tea, is dissolved out. The liquid so obtained is called an "infusion." Green tea contains rather more thein than black tea, and so produces a stronger infusion. Tea is a favorite table beverage from its stimulating properties. The cultivation of this plant in the Southern United States has proved successful.

Teak. [Malabar.] A tree found in India, the East Indies, and in Africa, the wood of which is very hard and durable. It is used in ship-building, and in the construction of buildings.

Teal. [O.E.] A small fresh-water duck. The male is handsomely colored, and has a bright green or blue patch on the wings. In America teals are valued as game birds.

Telau′tograph. A form of telegraph, invented by Prof. Elisha Gray, by which writing and drawings can be transmitted and reproduced in fac simile.

Tel′egraph. [Gk. *tele*, far; and *graphein*, to write.] Stretched wires along which messages are sent by electricity. (See *Electric Telegraph.*) The messages are given by a pointer in the Wheatstone, by a fillet of paper in Hughes's, by dots and dashes in Morse's, and by symbols in Bain's system.

Telep′athy. [Gr. *tele.*, far; pathos, feeling with.] The supposed transfer of thought from mind to mind without speech or other physical communication. It is claimed that the thought of one person has been recognized by another through a distance of many miles.

Tel′pherage. [Gr. *tele.*, far; *pherein*, to carry.] A method of conveying goods along a suspended wire by aid of an electric motor. It has been used to carry ore from a mine and to convey logs from a forest.

Tele′phone. [Gk. *tele*, far; and *phone*, a sound.] An instrument which enables persons to talk to each other at considerable distances by electric wires. In its use a thin sheet of metal is set in

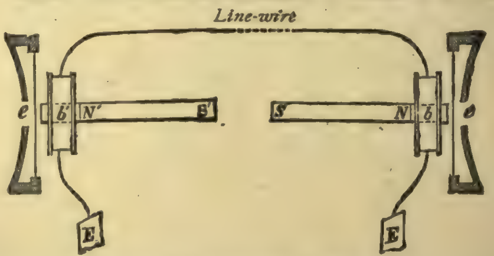


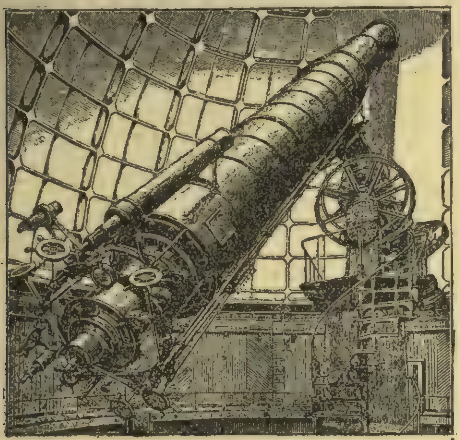
DIAGRAM OF TELEPHONE TRANSMITTER.

NS, N′ S′ cylindrical steel magnet surrounded at one end by a coil of wire, *bb′*, whose ends are connected by wires, with line wire and the earth, *E e*, is mouthpiece in front of which is a very thin sheet of metal which vibrates.

vibration by the tones of a person's voice. These vibrations cause rapid alternations of strength in a current of electricity passing through a wire. At the opposite end of the circuit the varying currents act to set a second thin plate in vibration, and sounds are conveyed to the listener's ear like those of the speaker's voice. In this way the human voice can be transmitted for more than a thousand miles, and by a recent invention may soon be heard several thousand miles away.

Tel′escope. [Gk. *tele*, far; and *skopein*, to see.] An instrument consisting of a tube and magnifying glasses for seeing things at a distance. In reflecting telescopes the image is formed by one or two concave mirrors, a large one at the lower end and a small one at the upper end. Sir William Herschel's telescope contained one

mirror. In refracting telescopes the image is formed by refraction in an object-glass, and is magnified by an eye-glass. The largest refracting telescopes, made by Alvan S. Clark, are that at the Lick Observatory, Mount Hamilton, California, which has a 36-inch object-glass, and magnifies from 180 to 3,000 diameters; and the Yerkes of the Chicago University, with a 40-inch



THE LICK TELESCOPE.

object-glass and 64 feet of focal length. One of 48-inch object-glass was shown at the Paris Exposition of 1900. The Lick telescope separated the closest double stars known to us, and discovered the fifth satellite of Jupiter. Lord Rosse's telescope at Parsonstown is a reflector with 72-inch aperture. Common's reflector at Ealing is 5 feet in diameter. If the brightness of a star seen with the eye alone is one, with a 2-inch telescope it is 100 times as bright; with a 4-inch telescope it is 400 times as bright; with an 8-inch telescope it is 1,600 times as bright; with a 32-inch telescope it is 25,600 times as bright; with a 36-inch telescope it is 32,400 times as bright. That is, stars can be seen with the 36-inch telescope which are 30,000 times fainter than the faintest stars visible to the naked eye.

Tem′peratûre. [L.] The amount or degree of heat in any person, place, or thing; the condition which indicates whether heat will flow from one body to another, the body parting with heat being said to have a higher temperature, and the one receiving it a lower temperature than the other. In practice, temperature is measured by the expansion produced by heat in a liquid or a gas in a thermometer.

Ten′dril. [Fr. from L. *tener*, tender.] The long, slender, leafless shoot of a plant by which it clings to a support. They are the ends of stems, as in the grape vine; axillary branches in the passion flower, or ends of leaves in the pea.

Ten′tacle. [L.] A kind of arm or fleshy process attached to the head or body of some insects and other animals, by which they feel, grasp, or move.

Ter′ra-cot′ta. [L. *terra*, the earth; *cocta*, baked.] A kind of pottery or baked red clay. (See *Brick*.)

Ter′rier. [Fr. *terre*, the earth.] A small dog that burrows into holes in the earth after rabbits, rats, etc. The Skye has long hair and drooping ears. English and black and tan have short, close, smooth hair and upright ears. Fox terriers are both smooth and rough in variety.

Thatch. [AS.] A covering of straw, reeds, or rushes for roofs of buildings or stacks of hay or grain. Palm leaves are used in the West Indies for thatching.

Thermom′eter. [Gk. *thermos*, hot; and *metron*, measure.] An instrument for measuring changes of temperature by the contraction or expansion of a liquid or a gas. The three scales at present in use are—(1) the Fahrenheit, in common use in Great Britain and the United States; (2) the Centigrade, used on the Continent and in scientific works generally; (3) Reaumur's scale, used in Russia. In Fahrenheit's scale the freezing-point is marked 32°F. and the boiling-point 212°F. the intervening space containing 180°. In the Centigrade scale the space between the two points is divided into 100 equal parts—the freezing-point being marked 0° C., and the boiling point 100° C. In Reaumur's scale the freezing-point is marked 0° R., and the boiling-point 80° R., the space between the freezing and the boiling-points being divided into 80 equal parts. Since 180° on the Fahrenheit scale correspond to 100° on the Centigrade, the length of one degree Fahrenheit is 100-180th or 5-9th of one degree Centigrade, and any reading on the Fahrenheit scale is converted into the corresponding Centigrade reading by the following rule: Subtract 32 and multiply the remainder by 5-9th. When very low temperatures are required an alcohol thermometer is used, because mercury freezes at about −38° F. Air is of great use in determining temperatures above those at which mercury can be employed (mercury boils at 660° F.). Other types of thermometers are *maximum*, *minimum*, and *solar radiation* or self-registering thermometers. (See *Fahrenheit*, *Reaumur*.)

Thim′ble. (From *thumb*.) A sheild for the finger, used in sewing. It is usually made of metal, and has on the outer surface small pits to catch the head of the needle. A machine-made silver thimble takes more than 20 men to make it. The silver is rolled into strips, cut, punched, edges turned, stamped into shape, indented, polished, and engraved.

This′tle. [AS.] A plant with prickles along the stalks and leaves. There are many varieties. The cotton thistle, the musk thistle, and the bull or spear thistle are used as national emblems of Scotland. Seeds of thistles have downy fibres, and are thus easily blown about and carried great distances.

Thrush. A large family of insect-eating birds, found in nearly all parts of the world. The wood-thrush is one of the most abundant American species, and is noted for the beauty of its

song. The hermit-thrush and the mocking-bird (*q. v.*) are other American species. The brown-thrush, or thrasher, as it is called, is a handsome bird, with habits like those of the mocking-bird, which it ranks next to as a singer. The song-thrush of Europe, sometimes called the *throstle* in England and the *mavis* in Scotland, is much like the wood-thrush. The robin, the blue-bird, and the wren belong to the thrushes.

Thun′der. [AS.] The loud noise which follows lightning. The rattle of a discharge of atmospheric electricity.

Thyme. [Gk.] A pungent, sweet-smelling plant, much used to give a relish to seasoning and soups. Oil of thyme, distilled from it, is used in liniments.

Tick. A species of insect parasites which are often very annoying. They are of minute size and have the mouth shaped like a sucker. They are found in thick woods on plants, and attach themselves to any animal that passes. They attach their sucker to the skin and work their way into the flesh, sucking the blood. They multiply so fast that many horses and cattle die from exhaustion, due to loss of blood. The ox-tick, when filled with blood, is half an inch long. The water-tick, another variety, always lives in the water.

Tides. [AS.] The rising and falling of the sea, caused by the moon's action. Owing to gravity, the moon exerts an attraction on every part of the earth, whether liquid or solid, but only the liquid parts which constitute the ocean are free to yield to the attractive force. When the moon is overhead, the water is drawn outwards and heaped up on the side of the earth next the moon. The projecting portions of the water under the moon, on both sides of the earth, represent the positions of high tides, while the low tides occupy the intermediate positions, and we experience what is called high or low water, according as the higher or lower part of the wave reaches our shores. The sun as well as the moon produces tides; but owing to its greater distance, the effect produced by the sun is small in comparison with the attraction of the moon. When the sun and the moon act together we have *spring tides;* when in opposition we have *neap tides.* When the tide rushes up a narrow channel, it rises to an unusual height. In the Bay of Fundy the rise and fall is not less than fifty feet, and in the Bristol channel there is a rise of about thirty-eight feet at spring tides. In the Mediterranean the tides have only a small range, varying from one to two feet.

Ti′ger. [Gk.] A carnivorous quadruped, like the lion in all its habits, except that it roams about by day as well as by night. In color it is yellow, with black stripes across the body. Its body is longer and stronger than the lion's, but shaped more like a cat's. It has no mane. Its under part, as well as the chest and throat, are white, and so are the long hairs on each side of its face. The tail is like a cat's in shape, and has no tuft at the end. The tiger is found chiefly in India and Ceylon. Indian princes hunt it with elephants.

Tile. [AS. *tigel.*] A piece of baked clay of a curved or flat shape used in roofing houses or for drains. (See *Brick.*)

Tin. [AS.] A metal white, like silver, easily melted or beaten out. Owing to the fact that it does not tarnish either in dry or moist air, it is

TIGER.

much used for cooking-vessels, especially in the form of tin-plate. Tin is also used in the preparation of several important alloys, such as bronze, pewter, Britannia metal, bell-metal, etc. It does not occur in the native state, the tin of commerce being obtained from the dioxide, known to miners as tinstone. The chief European supply of this mineral is derived from the mines of Cornwall. It is also met with in the Malayan peninsula, the isle of Banca, and Australia. Deposits have been found in the United States, but none that paid to work. In order to prepare the metal, the tinstone is broken into fragments; and as it remains among the *debris* unchanged in character, it can, like gold, be separated from the lighter portions of rock by washing. It is then reduced to the metallic state by roasting in a furnace.—*Tin-foil*, tin beaten out very thin, like a leaf.

Tin-plate. The name given sheet-iron coated with tin. It is largely manufactured in South Wales, and of late years in the United States. The plates are dipped in acid and afterwards washed in water to insure their being perfectly clean. They are then toughened by passing them between polished rollers, coated, and passed between steel rollers. Tin-plate is used extensively in the manufacture of kitchen utensils, and for the tins required in preserving meat, fruit, and vegetables.

Tin′sel. [Fr.] A thin kind of cloth interwoven with gold or silver threads, or thin metal covered thinly with gold or silver.

Tint. [Fr.] A shade of a color. Red and black make brown; red and yellow, orange; blue, black, and red, olive; blue and lead, pearl; blue, white, and lake, purple; blue, white, and black, pearl gray; white and lake, rose; white and brown, chestnut; white and carmine, pink; white and green, bright or pea green; white and lampblack, lead; white and purple, French white;

white and yellow, straw; white, yellow, and red, cream; white, yellow, and Venetian red, buff; white, lake, and vermillion, flesh color.

Tit′mouse. [O.E.] A little song bird which feeds on insects. The blue, marsh, crested, and long-tailed titmice are the best known European species. The chickadee or black-cap tit is a common American species, and the tufted tit the largest. *Tit* is the titlark; *tomtit* is the blue titmouse or the wren.

Toad. [AS.] A crawling animal like the frog, but without teeth, and more terrestrial in its habits. It has a thick and heavy body, covered with wart-like glands, which secrete an acid fluid. The tongue is well developed, and can be protruded rapidly to capture insects. The skin absorbs moisture, and is cast off at intervals and swallowed. The winter is spent in a torpid state in holes and crevices. Toads are long-lived, and are found all over the world. They feed on insects injurious to vegetation. Tree-toads have loud, shrill cries, and are often brightly colored. The Surinam toad of Guiana is eaten by the natives. Its eggs are not laid in water, but are received by the male, who deposits them on the back of the female, where the skin thickens between the eggs, till each is invested in a sac, in which the young go through changes, and each emerges a perfect toad.

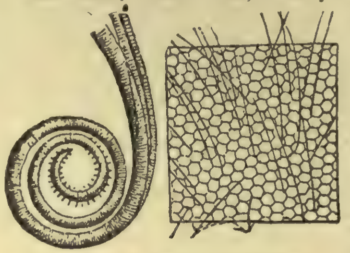
Tobac′co. [Span., from Ind.] A plant of the Nightshade family, the leaves of which when dried are used for smoking. It was found in America—in use among the Indians—by the Spanish discoverers. The plant is four or five feet high, has a moist, hairy stem, and leaves sometimes two feet long. The leaves are arranged round a single stalk, and the flowers, which are white and shaped like a funnel, grow at the top of the plant. Only plants grown for seed are allowed to blossom. It is grown in the West Indies, in the southern United States and in other countries. Much is grown in the Philippine Islands. Tobacco leaves rolled up tightly form cigars. The leaves are also twisted, pressed into cake, or cut fine. In making chewing and smoking tobacco in the United States, the leaves are sweetened, colored, and flavored with molasses, liquorice, salt, soda, saltpetre, and aniseed. Snuff is the leaf and stalks ground into powder. Much tobacco is used in the form of cigarettes.

Tobog′gan. An Indian sledge, made of a piece of birch-bark, with the front end turned up, and a rope attached to drag it over the snow. This became much used by the white settlers in Canada, and is now employed in the sport of sliding down a hill of snow, or a timber slope called a *toboggan slide*. In this form it is made of hickory splints, 5 to 15 feet long.

Toma′to. [Span.] An annual plant of the Nightshade family; also its fruit, which was formerly called *love apple*. It is of a red or yellow color. The tomato is of South American origin, but is now an important article of diet in the United States, England, France, and Italy. Its stem is weak, its leaves irregular, and both are clothed with hairs of a resinous substance. It has yellow flowers, and its fruit requires a high temperature to ripen.

Tongue. [A.S.] The fleshy movable organ of the mouth, used to taste or speak. In some insects, as the butterfly, it is a very curious organ.

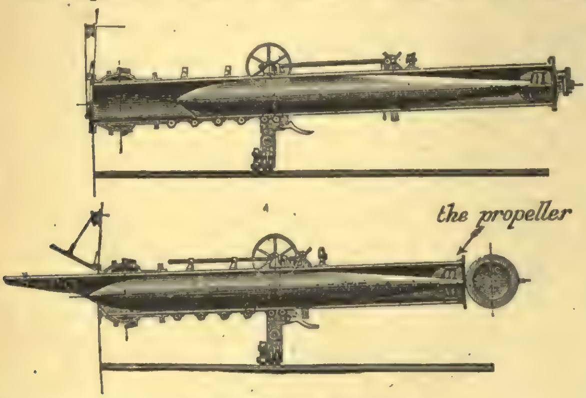
Tooth. [AS.] A small, hard body in the jaws, used for biting and chewing food. Like the nails and hair, teeth may really be considered as portions of the skin made compact and dense by the deposit of various mineral substances. Man has *two sets* of teeth; the first set, the milk-teeth or temporary teeth, are twenty in number. They are got when two years old. At six years the permanent teeth, growing up from beneath the milk-teeth, push the latter out, and at ten all the temporary teeth have been replaced by permanent teeth, altogether thirty-two in number—sixteen being placed in the upper, and sixteen in the lower jaw. Teeth are of different shapes, because some are intended for one purpose, and some for another. The part of the tooth imbedded in the gum is called the *fang*, while that above the gum is known as the *crown*; the crown of each tooth is overlaid with a pearly-white enamel. The eight teeth in the front of the mouth—four in the upper, and four in the lower jaw—have sharp cutting edges like chisels, and are called *incisors*; they are useful for biting or separating food. One on each side above and below are the four *canine teeth* or eye-teeth, called *canine* because they are so large and prominent in the dog (Latin *canis*, a dog), and also in all beasts of prey. These canine teeth are useful for *tearing* and for biting the food. Farther back in the jaws are eight teeth (two on each side above and below) called *pre-molars*, because they are next to the *molars*, twelve large teeth which occupy the hinder parts of the jaws. Both molars and pre-molars are mainly useful in *grinding* the food; whence their name, from the Latin word *mola*, a mill. The four last molars at the ends of the jaws are called the "wisdom teeth," because they are the last to be cut, usually not making their way through the gum till the age of twenty one. The teeth are not perfectly solid. Inside of each tooth there is a little hollow called the pulp-cavity, which contains several nerve-branches. These nerves pass along each fang into the gum, and are there connected with other nerves which go to the brain. When from any cause the enamel of the tooth is worn away, the delicate contents of the pulp cavity are exposed to the air, and to pressure from any little hard bits of food which may get inside the hollow place. Cold or pressure on the nerves produces the intense pain called toothache.



TONGUE AND EYE OF BUTTERFLY.

To'paz. A mineral ranked among the precious stones. It is found in Scotland, Cornwall, Saxony, Siberia, the United States, Mexico, and Brazil. The finest varieties are found in Brazil and the Ural Mountains, and are of a deep yellow tint, while those of Siberia are blue, the other colors found being white and green. They are frequently found in the cavities of granite rocks, and consist of a silicate of alumina in which fluorine takes the place of oxygen. It is next to the sapphire in hardness. The topaz of the ancients, obtained from *Topazos*, an island in the Red Sea, was *chrysolite*.

Torpe'do. [L.] A kind of fish related to the rays, with the power of giving an electric shock; also an explosive below the water to explode an



SELF-PROPELLING TORPEDO.

enemy's ship when touched or fired by electricity, or a sub-marine boat carrying the explosive.

Torpe'do boat. A recent form of naval vessel used to discharge torpedoes against a hostile vessel for the purpose of destroying it. These vessels are small and very swift, some of them making over 30 knots an hour. As yet they have not proved very serviceable in naval warfare.

Tor'toise. [Fr., from L. *tortus*, twisted.] A creeping and swimming animal (so called from its *crooked* feet) covered with a hard shell, with openings for the head, legs, and tail. The tortoise is also called *turtle*, but this name is sometimes restricted to the marine species, *tortoise* to the land species, and *terrapin* to fresh-water species. Tortoises are mostly used for food; and the green turtle, a marine animal, is extensively used for soup. The common box tortoise is more thoroughly protected than ordinary turtles, because it has joints at the bottom of the shell, and can draw up the under parts all round the edge of the box.—*Tortoise shell.* The shell of the hawk's-bill turtle, separated into thin plates, softened in hot water, and shaped in molds, in which it may be impressed with ornamental figures. It is used for combs, knife-handles, etc.

Tou'can. [Braz.] A fruit-eating bird, with a very large but light and thin beak, often as long as the body of the bird. It is brightly colored.

Tour'maline. A mineral found frequently in granite, gneiss, and mica schist. Some varieties are more or less transparent, others opaque. The transparent colored kinds are used as jewels, and prisms of tourmaline are used in experiments on the polarization of light.

Tow'er. [Fr. from L. *Tunis*.] A building of considerable height used for observations or for architectural effect. *Gay-Lussac's* and *Glover's towers* are used in making sulphuric acid. *The Tower of London* is famous in history as a State Prison. The *Leaning Tower* of Pisa, Italy, is 180 feet high, and is 14 feet out of perpendicular. The *Eiffel Tower*, Paris, is 985 feet high and built in 1889.

Trade-winds. Persistent winds which rise in the torrid and lower temperate zones and blow steadily towards the equator, being deflected westwardly by the earth's rotation, so that they become northeast or southeast winds, as they are north or south of the equator. They are caused by the ascent of heated air in the equatorial region, and the inflow of colder air to take its place. The ascending air outflows to the north and south and gradually descends to the surface, making what are known as *anti-trade* winds. The trades diverge to the north or south as the sun does so in its annual round.

Tram'way. [E. *tram*, a bar; and *way*.] The English term for a street railway; a road laid with beams or rails, on which wagons or carriages can run easily.

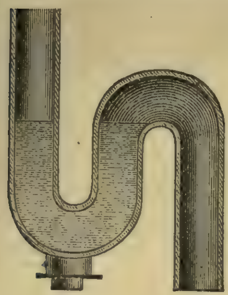
Trans'it Instrument. An instrument for detecting the time of transit of a star across the meridian. It consists of a telescope mounted on a horizontal axis.

Trap. [AS.] A contrivance to prevent the passage

THE LEANING TOWER OF PISA.

of offensive gases along a drain. The siphon trap, which is perhaps the best and simplest, is merely a bend in the pipe, which remains filled with

water. There ought to be traps placed where the pipes from the inside of the house join the drain, and there should also be a trap just where the drain joins the sewer. But drains and sewers ought both to be *ventilated*—to have openings for the bad gases to escape.



TRAP.

Trapeze′. [Gk.] A swinging bar, hung from a roof, on which athletes perform.

Trawl. [Fr.] A net like a bag used for catching fish. It is attached to a beam with iron frames at its end, and is dragged at the bottom of the sea.

Trea′cle. [Fr., from Gk. *theriaka*, drugs for healing the bites of wild beasts.] Molasses drained from sugar-refining molds.

Tre′foil. [Fr., from L. *tres*, three; and *folium*, leaf.] A three-leaved ornament, like the three-leaved clover.

Trel′lis. [Fr., from L. *trichila*, an arbor.] A kind of network made by crossing strips of wood or iron, for supporting climbing plants, or as a screen.

Tre′pan. To take out a portion of the skull in case of injury to the head or disease of the brain. This is done by means of a small circular saw, which cuts out a round piece of the bone. In healing, the bone throws out granulations, which gradually ossify, but do not quite close up the opening.

Trichi′na. A minute worm which infests the intestinal canal of certain animals, including man and the hog. This is in the adult procreative state. The young, larval trichinæ bury themselves in the muscles, where they exist as spirally-coiled worms in minute cists. Their danger to man is in their immense numbers. In a cat, a single ounce of flesh was estimated to contain 325,000 trichinæ. They enter man principally through partly cooked pork. Thorough cooking destroys them and obviates the danger of infection.

Tri′cycle. [Gk.] A vehicle with three wheels, one or more of which are turned by the feet by means of pedals.

Trout. [AS., from Gk. *trogein*, to eat.] A beautiful silvery fresh-water fish of the genus *Salmo*, very much prized for food, and a favorite fish for anglers. The most important are the brown-trout and the salmon-trout. Its habits are solitary and very predaceous. It feeds upon worms, minnows, insects, and caterpillars. The minnow is the most taking bait for large trout. The trout is found in lakes and rivers, but the most brilliant and beautiful fishes are found in streams flowing over chalky and rocky soils. River-trout attain to a length of 30 inches. Sea-trout or bull-trout are found 3 feet in length.

Tridac′na. The largest of the bivalve molluscs. A single shell has been known to weigh more than 500 pounds. The valves are deeply furrowed and handsomely grooved, and are used as ornaments for grottoes and fountains. The animal is edible, and one makes a meal for several persons.

Tri′lobite. A fossil crustacean belonging to the primary geologic age. There are numerous species in the Silurian and Devonian periods and a few in the coal strata,—named from their three-lobed bodies. Their nearest modern representative is the King-crab.

Trol′ley. Formerly a small truck or set of wheels carrying a box or car-body. Now a grooved wheel which rolls in contact with an electric wire, and takes off the current to transmit it to the motor of an electric or *trolley* car beneath.

Trump′et. A wind musical instrument with a clear and ringing tone. Its scale in the lower octaves is limited to the first natural harmonics, but by valves or pistons trumpets can produec every note in their compass.

Tset′se fly. An African insect, whose bite is harmless to man, but nearly always fatal to the ox, horse, or dog. It is about the size of the common house-fly, and lives by sucking blood. It is thought to transmit a disease germ to the blood.

Tube-rose. A variety of the primrose, cultivated in gardens for its vari-colored, gay-looking flowers.

Tu′lip. [Fr., from Per., a turban.] A garden plant growing from a bulb, and so called because of its supposed likeness to a turban. In the seventeenth century the cultivation of tulips in Holland became a mania, and tulip-bulbs were sold and resold as stocks on 'Change.

Tulle. [Fr.] A kind of thin silk or muslin netting for veils; so called from Tulle, a town in France.

Tum′bler. A large drinking-glass, formerly so made that it could not be set down without tumbling over, and thus requiring the liquid to be finished at one draught; a kind of pigeon which tumbles when flying.

Tun′ing-fork. An instrument of steel like a fork, which when struck gives out a fixed tone taken as a key-note.

Tun′nel. [Fr.] A passage underground or through a hill. The St. Gothard tunnel is 9½ miles long (48,840 feet); that of Mont Cenis, 39,840 feet; Hoosac, 25,080 feet; that under the Mersey 4½ miles, including approaches. Tunnels are now blasted out with nitro-glycerine fired by electricity.

Tun′ny. [Gk., to dart along.] A large fish of the Mackerel kind, found in the Mediterranean and Atlantic.

Tur′bine. [L.] A water-wheel with curved floats or buckets, against which the water acts either from above downward or from below, or inward from an external casing.

Tur′bot. [Fr., from L. *turbo*, a whipping top.] A large, round flat-fish of the Flounder kind,

used for food. The upper side is brownish and lower side white. It is voracious and feeds on other fishes. It is abundant in the North Sea. At one catch off Jutland 240,000 were caught, averaging more than one pound each. There are no turbots on the American coasts.

Tureen′. [Fr., from L. *terra*, earth.] A large, deep dish of earthenware in which soup is served.

Tur′key. A large scratching fowl, which received its name because it was by some supposed to come from Turkey, but really a native of North America. It is now bred in many countries. The tame turkey is duller in hue of feathers, but is generally much larger than the wild turkey. Its flesh is much valued, and in the United States roast turkey is the favorite Christmas dish.

Tur′meric. The root of an East Indian ginger-like plant. It is used as a curry, to give color to varnishes, to dye silks and woolens yellow, and as a test for alkalies.

Tur′nip. [Fr. *tour*, a turn; and AS. *naep*, a turnip.] A plant with a large round root, tapering downwards. A native of Europe and the temperate parts of Asia. It is a common garden vegetable, and in many countries it is largely grown for sheep and cattle food. The Swedish turnip, or *ruta baga*, is much used in Europe for this purpose.

Tur′pentine. [Gk. *terebinthos*.] The oily resin of the terebinth and some kinds of larch, fir, and pine. A cut is made through the bark of the tree, and the sap flows into jars. This is viscous like honey, and is crude turpentine. Oil of turpentine is distilled from crude turpentine, the solid part being yellow resin, used in making soap. Turpentine is used extensively in mixing paints and varnishes, and is also used in medicine.

Turquoise′ (*turkois*). [Same word as *Turkish*.] A precious stone of bluish-green or sky-blue color, brought from Persia. It is a phosphate of aluminium, its color being due to the presence of iron or copper.

Tur′tle. [From Span. for *tortoise*.] A reptile enclosed in a double shield or shell, from which the head, legs, and tail are protruded, but under which they can be drawn. The shell is an expansion of the vertebræ and ribs. Turtles do not shed their shells, and have no teeth, but have horny jaws. They are ocean swimmers, coming on shore only to lay their eggs in the sands. Some of them are very large. The name is also often given to the land tortoise. (See *Tortoise*.) The green turtle is much esteemed as a table delicacy.

Tusk. [AS.] A very long, pointed tooth on each side of the mouth, found in certain wild animals, as wild boars, elephants, etc.

Twi′light. [AS. *twi*, double; and *light*.] The dim, faint light before sunrise or after sunset. It is produced when the sun is 18° below the horizon by the reflection of the sun's light from the higher regions of the atmosphere. In the tropics the duration of twilight is shorter than in more northern latitudes.

Tym′panum. [Gk.] The drum of the ear (*q. v.*)

Type. [Gk. *typtein*, to strike.] A letter cast in metal in a mold or cut in wood for printing. Including fancy types, some three or four hundred varieties of face are made. Besides ordinary Roman and Italic, the varieties most in use are Old English, Old Style, Clarendon, Antique, Black Letter, and Script. The principal sizes are—Ruby, Diamond, Pearl, Agate, Nonpareil, Minion, Brevier, Bourgeois, Longprimer, Small Pica, Pica, English, Greatprimer. Type-metal is an alloy of lead and antimony, sometimes with a little tin or nickel or copper. In type-founding a punch or die is first made on the end of a bar of soft steel, and then hardened; then a matrix is made in copper, with a mold or box in two parts for casting.

TYPEWRITER.

Typewriter. A machine which is used to print Roman letters in place of script writing—for all work usually done with a pen. There are many kinds, but most of them have key boards; by depressing these types are pressed against the paper through an inked ribbon.

Ty′phoon. A ferocious whirlwind or tornado, common in the China seas, and of irresistible violence.

U

Um′ber. [Fr., from L. *umbra*, shade.] A brown or reddish kind of earth, consisitng of clays mixed with oxides of iron and manganese. It is used in oil and water-color painting.

Umbrel′la. [L. *umbra*, shade.] A shade or screen used as a protection from the rays of the sun or from rain. It is formed of strips of whalebone or steel fastened to a stick or hollow iron rod and covered with silk, cotton, or alpaca. Umbrella silk is made chiefly in Lyons and Crefeld.—The *umbrella tree* is an American magnolia with white flowers and rose-colored fruit, the leaves being crowded on the top of the flowering branch in an umbrella-like circle.

U′nivalve. A mollusc whose shell consists of only one piece, as distinguished from the bivalve, or double-shelled molluscs, like the oyster. The univalves are the most numerous of the molluscs, and differ very greatly in size, shape, and color, many of them being very graceful and beautiful. A familiar example is the land snail.

U′pas. [Malay.] A poison, used to poison arrows, contained in the upas trees, a native of Java and Borneo. It was formerly supposed to have fatal effects, from its severe narcotic properties, to all animals which came under its shade. These stories are fabulous, but it exudes a gum resin which is very poisonous. It belongs to the bread-fruit genus.

U′ranium. [From the planet Uranus, discovered about the same time.] A metal discovered in 1789, as a constituent of several minerals. It is a very hard metal, resembling nickel and iron in appearance. Peroxide of uranium is used to color glass green or greenish-yellow, and a sub-oxide is employed in porcelain painting to produce an intense black. The metal is rare and costly.

U′ranus. The planet next beyond Saturn, and supposed to be the outermost until the discovery of Neptune. Its distance from the sun is 1,771,000,000 miles; its diameter 31,700 miles; its year 84 earthly years in length.

U′ric Acid. A crystalline body present in the urine of man and of most mammals, and sometimes called lithic acid, because of its presence in calculus.

Ur′sa. [L.] The Bear—a name given to two groups of stars near the north polar star. The Ursa Minor, or Lesser Bear, contains the pole star. The Ursa Major, or Great Bear, consists of a group of seven bright stars, two of which—*the pointers*—point to the pole star.

V

Vaccina′tion. [L. *vacca*, a cow.] Jenner in 1796 noticed that persons who had much to do with cows, and who had caught from these animals a mild disease known as cow-pox, did not afterwards catch small-pox. The *lymph* by which the cow-pox is transmitted is a clear fluid obtained from a cow or a calf, or from the swelling on the arm of a vaccinated person. This lymph is introduced into the body by scratching the arm and then rubbing into the blood the lymph from little glass tubes.

Vac′uum. A space devoid of matter. The term is ordinarily applied to the results of the exhaustion of air from a chamber of glass or other substance. The vacuum produced by the air pump is far from perfect, and various means are in use to produce a more complete exhaustion. A very efficient one is the Sprengel pump, in which mercury flows down a long tube of narrow bore, and carries with it the air from a connected vessel. The best vacuum obtainable by the air pump is 150 times the millionth of an atmosphere; while the Sprengel pump yields .005 of the millionth of an atmosphere.

Val′ance. [Fr. *Valence*, a town near Lyons.] The hangings round a window or the lower part of a bed.

Valve. [L. *valva*, the leaf of a folding door.] A kind of flap or lid in a pipe or a blood-vessel which allows a fluid or gas to flow only in one direction, as in the common pump. There are a flap-valve, puppet-valve, ball-valve and slide-valve. A *safety-valve* is held shut by a spring or weight, and opens automatically to allow steam, gas, or water to escape when the pressure becomes too great. The valves in the blood-vessels assist the flow of blood through the veins.

Vanil′la. A climbing plant, native of Mexico and tropical America, with long pod-like capsules and a delicate odor. From it is extracted an oil used in confectionery and perfumery. The pods are cut and ground,and mixed with weak alcohol.

Var′nish. [Fr., from L. *vitrum*, glass.] A liquid laid on a surface to make it glossy. According to the solvents used, varnishes are divided into spirit, turpentine, and oil varnishes. The chief resins used in varnishes are copal, mastic, lac, benzoin, amber; and these are mixed in alcohol, turpentine, ether, linseed and olive oils.

Vas′eline. A yellowish, translucent, and odorless substance, obtained in the purifying of crude petroleum, used as an ointment and in the arts.

Vault. [Fr., from L. *volutus*, rolled.] A roof or ceiling in the form of an arch, or an underground room with arched roof. A groined vault has the roof groined, or with different cylindrical surfaces intersecting one another.

Veg′etable. [L.] A plant grown for food, as the cabbage, potato, turnip, etc. The *vegetable kingdom* is the primary division of living things, which includes all plants, and is divided into *Phanerogamia*, or plants having distinct flowers and seeds—sub-divided into exogens (*q.v.*), endogens (*q.v.*), and gymnosperms; and *Cryptogamia*, or plants without true flowers, and reproduced by minute spores,—subdivided into ferns, mosses, and liverworts, and the algæ, fungi, and lichens.

Vegeta′tion. The growth of plants. Vegetation occurs over the whole globe under the most opposite conditions. Plants flourish in the bed of the ocean as well as on land; under the extremes of cold and heat in the polar and equatorial regions; on the hardest rock and the soft alluvium of the plains; amid the snow of the mountains, in boiling springs, in dark caverns or mines. Different circumstances produce different species and genera. Absence of humidity, and extremes of temperature, are the conditions fatal to vegetable life. Trees and plants which occur in the plains dwindle with increased elevation. Plants are capable of extended naturalization, but distinct vegetable regions occur in different zones or on different heights.

Vel′lum. [L. *vitulus*, a calf.] Calf-skin prepared for writing, and finer kinds of parchments.

Veloc′ipede. A vehicle propelled by the feet of the rider. The common form is the two-wheeled bicycle, but tricycles and quadricycles are somewhat in use.

Vel′vet. [Ital. *velluto*.] A pile formed of silk, or a mixture of silk and cotton, by short pieces of thread crowded together, or woven with a third set of threads so closely that they stand up and hide the warp and woof. The rows of loops are slit with a sharp knife. *Cotton velvet* is an imitation velvet made of cotton, and sometimes called velveteen.

Veneer′. [Fr.] A thin slice of wood of one kind glued on the surface of another to give it a good appearance. (See *Wood*.)

Ve′nus. The second planet in order from the sun, from which it is 67,000,000 miles distant, and around which it revolves in nearly 225 days. Its diameter is about 7,760 miles, very near to that of the earth. The length of its day is not known.

Veran′da. [Port.] A kind of covered gallery or balcony in front of a house.

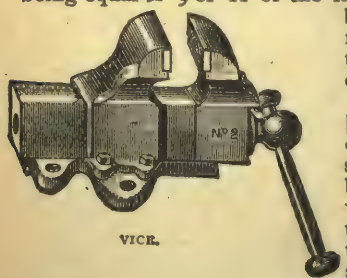
Verbe′na. [L.] A herbaceous plant with beautiful flowers. *Essence of verbena* is prepared from the lemon verbena, a plant with a lemon flavor.

Ver′digris. [L., green of brass.] Acetate of copper; poisonous green rust formed on brass or copper. It is used for making green paint and for dyeing wool black, in gilding and in calico printing.

Vermicel′li. [Ital., from L. *vermis*, worm.] Dough of wheat flour forced through small pipes or holes into *worm*-like threads. *Macaroni* is made through larger tubes.

Vermil′ion. [Fr., from L. *vermis*, worm.] A bright scarlet color got from the cochineal *worm* or insect. The vermilion of commerce is got by heating sulphur and mercury, and also by electricity. It is used in painting and in making sealing-wax.

Ver′nier. A small scale made to slide along the edge of a larger one, 10 divisions of the smaller being equal to 9 or 11 of the larger. Invented by Pierre Vernier to measure tenth and hundredth parts.



VICE.

Ver′tebra. [L., a joint.] One of the twenty-six separate bones, called vertebræ, firmly united together to form the spinal column or backbone (*q.v.*) in man and the higher animals.

Vice. [Fr. *vis*, a screw.] An instrument with two strong jaws, closed by a screw, lever, or cam, for holding things firmly when being filed. In the blacksmith's vice the front jaw reaches down further than in the machinist's and is loosely fastened at the bottom. Carpenters use wooden vices.

Vine. [Fr., from L. *vinum*.] A climbing plant bearing grapes from which wine is made. All the European varieties are supposed to belong to one species, *Vitis vinifera*. The chief districts are France, Spain, Portugal, Germany, Austria, and Italy, and this species is also grown in various other parts of the world, including California. There are several different species in the United States. (See *Grape*, *Wine*.)—Also any climbing or trailing plant, as hop vine, etc.

Vin′egar. [Fr.] A sour liquid, used as a relish for food, made from wine, cider, beer, malt, etc. The sourness is due to the presence of acetic acid, and of this there is from 3 to 5 per cent.

Vi′olet. [Fr., from L. *viola*.] A low creeping plant with a small flower, having a delicate fragrance. *Sweet violet* is the *Viola odorata*. *Pansy* is the *Viola tricolor*, and is also called heart's-ease.

Vi′olin. [Fr.] A musical instrument with four strings, played with a bow. Its tones are brilliant and of great power and variety, and in the orchestra it is the leading and most important instrument.—*Viola*, a violin a fifth lower in compass than the ordinary violin.—*Violoncello* [Ital.], a large bass violin with four strings, an octave lower than the viola.

Vi′per. [Fr., from L. *vivus*, living; and *pareo*, I beget.] A poisonous serpent; so named because it was the only serpent that was supposed to bring forth its young *alive*. The varieties include the common viper, the asp, the African horned viper, with a horny scale over each eye, Indian viper, and the red viper or copper-head, an animal like a rattlesnake without the rattles.

Vi′tascope. A moving series of photographs, giving the appearance of a living picture. Various names are given to the different forms of this, as biograph, mutascope, etc.

Vit′riol. [Fr., from L. *vitrum*, glass.] A *glassy*-looking substance consisting of sulphur and copper or zinc. Also the popular name for sulphuric acid (*q. v.*). *Blue vitriol* is sulphate of copper; *green vitriol* is copperas, or ferrous sulphate; *red vitriol* is a native sulphate of cobalt; *white vitriol* is zinc dissolved in sulphuric acid, and is a sulphate of zinc.

Volca′no. [Ital., from L. *Vulcanus*, god of fire.] A burning mountain, with an opening at the top called a crater, from which fire, steam, lava, cinders, etc., are thrown up.

Vul′canite. India-rubber (*q. v.*), or similar substance, hardened by heating with sulphur, and made into combs, buttons, etc.

Vult′ure. [L.] An important family of birds of prey. The neck of the vulture is bare, but at the lower part there is a loose fold of skin covered with feathers under which it draws its head to keep it warm. Vultures feed upon carrion, and seldom attack living animals. The condor, king vulture, turkey buzzard, griffin, and lammergeir are all vultures. The condor is the largest vulture of the New World and is found in the Andes. The lammergeir is found in Europe, Asia and Africa.

W

Wa'fer. [Fr. from Ger.] A thin cake of paste used in closing letters.—A thin cake or piece of ground bread used in the mass. This is usually unleavened, circular, and stamped with a crucifix or monogram.

Wag'tail. A small song-bird belonging to the genus *Motacilla*, and so called because it jerks its tail up and down. The common water wagtail is also called the pied wagtail. It is mixed white and black in color, and lives on the edges of ponds and streams. The *Wood wagtail* is found in Asia, and has a slender bill and short legs.

Wain'scot. A boarding or lining of oak or other timber in panels.

Wall-flower. A perennial plant with sweet-smelling flowers, growing in old walls and among ruins. It varies in color from yellow to orange and deep red.

Wal'nut. [AS.] A tree of large size, with alternate, pinnate leaves, found chiefly in North America. The black walnut is a beautiful timber tree found in the United States, with a heartwood of a warm brown color, a favorite wood for furniture making. The nut is round and oily, enclosed in a hard shell with a fibrous outer covering. The white walnut is a North American tree with long oily nuts, and hence called butternut. It also yields a valuable wood. There are some species found in Asia, whose wood is used in cabinet making, and the nut used for dessert and pickling. The nut yields walnut oil used in cooking.

Wal'rus. [Du., from Scand., the whale-horse.]

A large polar animal allied to the seal—also named *Morse*. Two of its upper teeth are prolonged into huge tusks, which measure from one to two feet, and weigh nearly five pounds. It is one of the largest animals of the frozen regions. It sometimes measures eighteen feet in length, and weighs a ton. It is hunted for the blubber or fat that encases its flesh, which yields oil, and for its ivory tusks. Like the seal, it is a very clumsy animal on land or ice, and it is always found near open water. All it wants is a comfortable spot to lie on, the sea being its refuge in times of danger. The walrus is caught by means of a barbed spear or harpoon, which is suddenly thrust into its body by the native hunter, who has crawled slowly and silently within striking distance.

Warp. [AS.] The threads running the long way way of the loom and crossed by the woof. (See *Spinning*, *Weft.*)

Wart. [AS.] A small, hard growth on the skin, generally on the hands.—*Wart-hog* is a large African wild hog with large fleshy tubercles or warts behind the tusks, and a second pair behind the eyes, and with a mane along its back.

Wasp. [AS.] An insect somewhat like the bee, but its wings when at rest are laid over the body, and it has a deep division between the thorax and abdomen. Some live in colonies and some alone. When winter approaches all the wasps die except the females, which sleep through the cold. The nests of social wasps are built of paper, beautifully variegated and very durable. The young of social wasps feed on insects and larvæ brought to them by the old wasps, who feed mainly on honey and pollen of flowers and sweet juices of fruits. Some wasps make their nests in holes in the ground, and others fasten them to walls or the branches of trees. The sting of the wasp is barbed like that of the bee. Dry seasons are favorable to them. Sugar in some fruits, as grapes and plums, most attacked by wasps, turns into alcohol in the process of rotting, and this makes wasps somnolent, but inclined to sting. The mud-wasp deposits a supply of stunned spiders with its egg in a cell for the larva to feed upon. Sand and wood wasps are solitary kinds. The females dig out cells in rotten wood with their jaws. Sand-wasps dig holes using the hairs on their legs. (See *Hornet.*)

Watch. [AS.] A pocket timepiece. The train of wheels is the same as in a clock, but the mainspring and balance take the place of the weight and the pendulum in a clock. Watches are made mostly in Switzerland, England, France, and the United States. American watches are all made by machinery, the parts being cut so as to fit in all watches of the same kind. Watches are distinguished by the kind of escapement used—as verge, lever, duplex lever, and chronometer watch; also by the cases they are enclosed in—as open-faced, and hunters and half-hunters, which have closed and half-closed faces. Keyless watches, wound up by a knob on the stem, have taken the place of those wound up by a key.

Wa'ter. [AS.] The fluid which falls in rain and forms rivers and seas. Like air, water was formerly

considered a simple substance; but about a century ago the compound nature of water was discovered. Now it is a familiar fact that it is composed of two elements, oxygen and hydrogen, in the proportion of two parts of hydrogen to one of oxygen. At temperatures below freezing point (32° F.) water exists in the solid form of ice; between freezing point and boiling-point (212° F.) it takes the liquid form; and above boiling-point it exists in a gaseous state as vapor or steam. When the sun shines on the seas and rivers, the heat evaporates daily a quantity of

A DROP OF WATER, MAGNIFIED.

water. Rising up into the air, and carried along by the winds, this water-vapor is condensed, and falls as rain. Rain-water is in reality a kind of distilled water. It is not perfectly pure, for in falling it dissolves some of the carbonic acid gas out of the air, and also brings down impurities as soot. Water containing carbonic acid dissolves limestone and gains a condition called hardness, which may be removed by boiling or by adding lime-water. Pure water is clear, without taste, and colorless. Water is most commonly seen in the liquid state, but it is easily converted into a solid or into a gas. When liquid water is cooled, it contracts, or becomes less in size, until it reaches 30°; if cooled still more, it begins slowly to expand; but when it is as cold as 32°, it suddenly expands, becoming about one-tenth larger, and forming the *solid* called ice. This is the reason why water-pipes often burst in frosty weather. The blood, which carries the food to all parts of the body, and removes the waste matter from every organ, is more than three parts water; more exactly, in 100 lbs. of blood there are 79 lbs. of water. Water forms about two-thirds of the total weight of the body. In 100 lbs., lettuce contains 96 lbs.; cabbage, 92; apples, 83; fish, 78; potatoes, 75; lean meat, 72; bread, 40; cheese, 34; rice, 15; butter, 10, parts of water.

Watermel'on. A fruit of a species of the genus *cucumis*, to which the cucumber also belongs, also the common musk-melon or cantaloupe. The watermelon plant is a running vine that bears a very large, round fruit, with dark-green spotted rind, and pink or white flesh, sweet in taste, and very juicy or watery. This makes it much prized in warm countries.

Wa'ter-gas. A kind of gas made by forcing steam over glowing coke. This yields a heat-giving mixture of hydrogen and carbon monoxide, which is charged with carbon and made suitable for illuminating purposes by passing through a volatile carbon.

Wa'terspout. A whirling storm at sea, similar in appearance to a tornado on land. From a dense cloud descends a conical pillar, of funnel-shape, under which the sea is violently disturbed, rising in a cone. Sometimes the two cones meet, but they more frequently disperse before meeting.

Waterwheel. A wheel turned by flowing or falling water and setting machinery in motion. There are three kinds, *overshot*, *undershot*, and *breast* wheels, named from the level at which the water strikes their float boards. A *turbine* is a horizontal wheel with a vertical axis, driven by the weight and impulse of the water as it falls on the vanes around the axis.

Wave. [AS.] A moving ridge or swell on the surface of water. Waves in deep water move onward, but the water of which they are composed is continually changing. Scoresby gave 600 feet as the maximum length of sea waves. In 1888 the *Umbria* was struck by a wave 50 feet high.—Heat, sound, and light are supposed to travel in waves. The *wave theory of light* regards its phenomena as due to transverse waves in an ethereal medium, their amplitude causing brightness of light, and their frequency causing its color. The colors of the spectrum are estimated to result from various rapidities of vibration, ranging from 459 to 727 millions of millions per second.

Wax. [AS.] A thick sticky stuff of a yellowish color made by bees (*q. v.*) to form cells for honey, and used in making sealing-wax (*q. v.*), in modeling and in making wax-cloth or floor-cloth. *Mineral wax* is a substance resembling wax, found in connection with deposits of rock-salt and coal, and is also called ozocerite. *Chinese wax* is secreted by the wax-insect used in candles and medicine. *Wax-palm* is a tree found in the Andes. Its stem is covered with a secretion consisting of resin and wax, which when melted with fat makes excellent candles. *Wax-bill* is an Asiatic and African finch-like bird with a beak red like sealing-wax.

Wea′sel. [AS.] A small flesh-eating animal with red and white soft silky fur. Its body is about seven inches long, its legs are short, and it has five claws on each foot. Its head is round, its muzzle sharp, its ears small and pointed, its jaws powerful, and it has whiskers like those of a cat. Its sense of smell is keen, its sight good, its hearing quick, and it glides like a snake, or runs swiftly, and jumps or climbs walls and trees with great ease. It is seldom seen during the day, but prowls at night in search of food. It feeds on rabbits, moles, mice, frogs, and birds. It is fond of blood, and likes to suck eggs in the poultry-yard, making a small hole in the end of the shell. Farmers favor weasels because they kill many vermin. In attacking their prey, they generally seize the animal by the back of the neck and drive their teeth into the brain. The weasel makes a nest of dry grass and leaves in a tree or ditch.

Weath′er. The state of the air at any time as regards heat, moisture, wind, rain, clouds, and electricity. The pressure of the atmosphere is an important factor in bringing about atmospheric changes, because air always flows from a region of high pressure to one of low pressure. The pressure of the atmosphere at any place is obtained from the readings of the barometer; but the direction and force of the wind depend upon the relative distribution of pressure at a given time over a large extent of country, and not upon the actual reading of the barometer at the particular place. Simultaneous observations are made at as many different stations as possible within the given area, and are communicated to a central station, where the readings are compared and the distribution mapped out. The direction of the wind can then be inferred from the fact that it blows from where the pressure is high to where it is low. The place where for the time being the pressure is lowest is said to be the seat of a barometric depression, and the heaviest fall of rain generally takes place in the neighborhood of such a depression. In the Weather Bureau of the United States, 83 per cent. of the forecasts given twenty-four hours previously have proved correct.

Weav′er-bird. A bird like a finch or sparrow, found in Asia and Africa, with hanging nest composed of interlaced grass. Some make their nests in the shape of a retort, with the opening at the bottom of the tube.

Wedge. [AS.] A piece of wood or metal, thick at one end and thin at the other, for splitting or fastening. The wedge is one of the six mechanical powers.

Weed. [AS.] Wild plants in cultivated ground. Weeds injure crops in several ways. They absorb some of the plant-food which has been prepared for the crop, and they keep air and sunlight from the cultivated plants, which look sick and weakly in consequence. The hoe is an instrument much used for destroying weeds. On a good farm, land is fairly *clean*, or free from weeds.—*Sea-weed*, any marine plant of the class Algæ, or any plant growing in the sea.

Weft. [AS.] The cross threads of a web carried by the shuttle from selvage to selvage, *woven* into the warp.

Well. [AS.] A deposit of water reached by a hole sunk in the earth. The water in *wells* is of the same nature as that of springs. Many towns are supplied with water from deep wells which reach beds of sandstone, lying perhaps 500 or 1,000 feet below the surface. The water of shallow wells in towns is almost certain to contain sewage, which has passed from cess-pools or leaky drains through the soil and gravel or sand until it has reached the well. (See *Artesian Well.*)

Whale. [AS.] A large swimming animal. The whale is not a fish, for its young are born alive, and are suckled, instead of coming out of eggs as young fishes do. Seals have feet that are more fitted for moving through the water than for moving on land; but whales cannot move on land at all, for they have no feet. Some kinds of whales are the largest animals in the world. Whales are sometimes found in large herds, or "schools" as they are called. They are killed for their oil by the harpoon (*q. v.*). When a harpoon has struck a whale, the rope fastened to its handle is quickly let out over the side of the boat, and the whale pulls it so swiftly that the men are obliged to pour water over it to prevent setting the wood on fire. When once a harpoon has pierced a whale, it can only be got out by cutting the flesh. A dying whale often struggles so fiercely that it is dangerous for a boat to be near it. The bomb-lance and gun now used in killing whales are safer and more expeditious. The sperm whale (*q. v.*) has very sharp teeth in its lower jaw, with which it can crush a boat. One monster actually destroyed nine boats. Its jaw is 16 feet long, 7 or 8 broad, and about 10 in height. The thrasher, a large and voracious shark with a long upper lobe on its tail, often beats or fights the whale. The Greenland whale, the rorqual, and one or two other kinds, have whalebone instead of teeth. The whalebone, of which there are 360 plates or pieces in one animal, is fastened to the upper jaw of the mouth, and hangs down. Each piece is from 10 to 14 feet in length, and is 11 inches broad at the root; and one whale yields one or two tons of whalebone. The blubber or inner skin, which contains the oil, may be 16 inches thick, and a large whale may yield 275 barrels of oil. The throat

of the Greenland whale is so narrow that it can swallow only the very smallest animals, such as shrimps and small jelly-fish, which are caught as in a net by the brush-like fringes on the edges of the whalebone. The throats of the spermaceti and rorqual whales are much larger. The rorqual is the largest member of the Whale family. Some of them are 85 feet long. But they are so savage, and their oil and blubber so inferior, that whalers do not often attack them. The whale has no hair, but the blubber keeps the outer skin oiled, enables it to resist the water, keeps out the cold, and from its lightness causes the body of the animal to float easily. The whale moves by its tail, which is so strong that it enables the largest of these animals to leap right out of the water. It uses its fins, or fore limbs, to balance itself, and also to grasp its young, of which it is very fond. The whale cannot remain long under water, and must come up for air every little while. But the nostrils of the animal are placed on the top of its head, so that when it rises very little of its body is seen. These nostrils are called blow-holes, and through them it spouts up spray as well as its own warm breath to a great height. The sperm whale has only one blow-hole. When under water the animal can protect both nostrils and ears by a sort of round stopper of skin and muscle, which fits so closely that not a drop can get in. Whales, often in hundreds, feed on the outskirts of herring and other fish shoals. The dolphin and porpoise are smaller members of the Whale family.

Wheat. [AS.] One of the cereal plants from whose seeds bread is made. After Indian-corn, it is the most important of American food-plants, and is widely grown in the temperate regions of the remainder of the world. Rice replaces it in importance in the tropics and in China. Wheat is, on the whole, the hardiest of the cereals, though oats are grown in regions where there is not enough heat to ripen the wheat. It is also the most costly of the cereals, yielding less and exhausting the soil more. There are many varieties—*autumn* and *spring*, from the times of sowing; *red* and *white*, from the colors of the grains; *bearded*, having ears with awns; *beardless*, having none; and *rivetts*, with a coarse straw. An average crop is from 25 to 30 bushels of wheat and 3,000 lbs. of straw from each acre. Silica and potash are especially needed by wheat, and so it grows well on stiff clays which contain much silica. Wheat has never been found growing wild in any part of the world. It was cultivated in Britain in the time of the Romans. It is now chiefly produced in North America, France, Russia, Germany, Italy, Hungary, and India. The United States is the greatest wheat producer, yielding in some years more than 600,000,000 bushels, while the yield of the whole world in 1899 was 2,725,000,000 bushels.

Wheel. [AS.] A circular frame turning round on an axle. The radii are spokes which are fixed in the nave or hub, through which is inserted the axle.—*Wheel and axle*, one of the six simple machines or mechanical powers, consisting of a wheel fixed to an axle, used for raising weights by a rope. The principle of equilibrium is the same as in the lever, but continuous. The gain in power is in proportion to the size of the circumference of the wheel as compared with that of the axle. If the circumference of the wheel be ten times that of the axle, then one pound attached to the wheel will balance ten pounds applied to the axle.

Whelk. [AS.] A shell-fish with a spiral shell, belonging to the genus *Buccinum*. It is common on the coasts of Europe and North America, and is used for food.

Whey. [AS.] The watery part of milk separated from the curd in making cheese. The greater part of the whey is water; but in this water are dissolved the *milk-sugar* and the *mineral matter* of the milk; the mineral matter is chiefly *phosphate of lime*. In 100 lbs. of cow's milk there are 92 lbs. of whey, consisting of—water, 86 lbs.; milk-sugar, 5 lbs.; mineral matter, 1 lb.

Whippoor-will. A North American bird of the Goatsucker or Nightjar family. It takes its name from its loud and plaintive nocturnal cry. Some regard it as a bird of ill omen.

Whirl′pool. A body of water whirling in a circle, and drawing into its centre whatever enters its waters. Whirlpools are situated in channels similar in configuration and in tidal phenomena. Charybdis is in the Straits of Messina. Maelstrom is on the north-west coast of Norway. Corrievrekin is in Jura Sound, Scotland. The Niagara whirlpool is really a large eddy in which whirlpools are constantly forming.

Whiskey. [Celt. *wisge*, water.] Spirit distilled from grain, potatoes, etc. Scotch or malt whiskey has the malt dried over a peat fire; Irish or grain whiskey is made from raw barley.

Whist. [From *hush*.] A game of cards for four, in which each person holds thirteen cards, and when these are played out the cards are shuffled and again given out. In short whist five points make the game, and two games a rubber.

White′bait. A small fish of the Herring kind, prized for food. It is supposed to be the fry of both herrings and sprats, the proportion of the latter being greater in winter, while the herrings are more numerous in the summer. Thames whitebait possibly find more suitable food there, and may be superior in condition and flavor.

Whor′tleberry. [Cor. of *myrtillus*.] A plant which grows abundantly in heaths and woods, and bears evergreen leaves, and a blue berry which may be eaten; also the bilberry, and in America the huckleberry. The cowberry has red fruit. The cranberry is closely allied to the whortleberry.

Wil′low. [AS.] A tree whose branches are slender and easily bent, used for basket making and wicker-work. The *Weeping* willow is a very ornamental species of Chinese origin, and has long slender branches that hang down almost perpendicularly. The *Pollard* willow is one with its trunk cut back to throw out fresh and numerous osiers. The *White* willow, the largest species known in Britain, and the *crack* willow, are used

in making charcoal. Willows occur in temperate and moist climates, but they have not been found in Australia or the South Sea islands.

Win′cey. A cloth made of linen and wool mixed. Also called linsey-woolsey.

Winds. Currents of air having their origin in the different pressures which exist in various regions of the atmosphere. Since the sun is shining more powerfully upon the equatorial than upon the more northern regions of the globe, the heated and therefore rarefied air ascends, while a current of colder air flows in from the poles on both sides to take the place of the ascending air. The ascending column of air flows over from the equator towards both poles, so that the general atmospheric circulation consists of an under current from the north and south poles towards the equator, and of an upper current from the equator towards both poles. This general circulation proceeds in spite of other circulations on a smaller scale or of a local character which may be going on at the same time. North-east and south-east trades occur in the northern and in the southern hemisphere. (See *Weather* and *Trade Winds.*)

Wine. [AS., from L. *vinum.*] A drink made from the sweet juices of fruits, which are pressed out, allowed to ferment, and then bottled. Grapes are chiefly used for wine-making. *Sherry* and *port* are made in Spain and Portugal. *Claret* is a light, rather acid kind of wine, made in France; from which country we also get *champagne*, a wine which contains much carbonic acid gas. The wines of Southern Europe excel in body and strength, but lack the aroma of Rhine wines. Large quantities of wine are now produced in the United States, especially in California. On an average, 100 lbs. of wine contains from 10 lbs. to 15 lbs. of alcohol. When wine is heated in a closed vessel, the alcohol rises out of it as vapor. If the vapor be then made to pass through a tube surrounded by cold water, it will be condensed to brandy.

ANCIENT EGYPTIAN WINE PRESS.

Wing. [Scand.] The appendage of the body of a bird or insect, by means of which it flies. The framework of the bird's wing is formed of a set of bones corresponding to those of the human arm and hand, but having only one perfect finger, corresponding to the index finger; and stretched over this framework is a thin covering of flesh and muscle from which grow the quills and smaller feathers. and these when spread out make up the broad wing. The upper surface is rounded, and the air can easily slide from its edges as it mounts in the air. Bats are the only mammals which fly, and their wings are arms and fingers lengthened out, and supporting a skin spread out like the cover of an umbrella on its ribs. There are other mammals, like the flying squirrel, the flying lemur, etc., which have a partial power of flight. The wings of insects are thin, often transparent, membranes. Some insects use them for only a brief period of their lives; the ants, after their marriage flight, cast off their wings and live without them afterwards. Some, as the flies, have two wings, but most insects have four.

Witch. A woman supposed to have a compact with the devil or with evil spirits, and given the power to perform supernatural acts. A man with similar power is called a *wizard.* Supposed witches have been persecuted from the times of Moses downward until about a century ago, and great numbers of persons have been put to death on accusation of witchcraft.

Win′tergreen. A common American plant, about 4 or 5 inches high, with small whitish flowers and red berries. It is also known as partridge-berry, checker-berry, mountain tea, and by other names. The plant has a pleasant aromatic taste and odor, and yields the *oil of wintergreen*, used as a stimulant, for flavoring syrups, and in perfumery.

Wireless Telegraphy. A newly invented method of sending electric telegraph messages without the aid of wires. The best-known invention is that of Marconi, an Italian electrician, the message being sent by the use of a powerful current of high frequency, which passes through the ether or the earth and acts on a suitable receiving instrument many miles distant. The distance to which messages can be sent is annually increasing.

Wolf. [AS.] A carnivorous animal of the Dog family. It is very cruel, fierce, and destructive, but is capable of great affection. In many respects it is like a neglected savage dog. It does not bark, but gives a hoarse howl; nor does it lap like the dog, but drinks by sucking. There are many kinds, varied in size, thickness of fur, and in color. The ordinary color is a yellowish gray, but there are also black, brown, and white wolves. They are found in Europe, Asia, and North America, but not in South America or Africa. Wolves do not lie in ambush, but run down their prey in open chase, their favorite prey being the allied species of the domestic dog and the Arctic fox. The coyote or American prairie wolf and the Japanese wolf are smaller species than the ordinary wolf or *Canis lupus.*

Wood. [AS.] The solid part of trees; trees cut down and sawn into boards. The wood used in the construction of houses is chiefly obtained from pine and from fir trees, the wood of both being called pine-wood. When sawn into boards it is known as deal; when split into thin narrow strips, it forms laths. The wood should be seasoned or thoroughly dried by exposure to the air for one or two years after the tree has been cut down. For making furniture, hard woods, such

as oak, maple, cedar, ebony, walnut, mahogany, and rosewood, are used. The two latter are often cut into very thin slices, called *veneers*, which are then glued on the surface of beech or some other cheap wood and made into furniture. Besides its importance in building and the manufacture of furniture, wood is necessary as fuel, and is greatly used in countries covered with forests where coal is not easily obtained. The toughest wood is pig-nut hickory; next, white oak and white ash. (See *Lumbering*.)

Wood′bine. [AS.] A climbing plant with sweet-smelling flowers; the honeysuckle.

Wood′chuck or **Ground-hog.** An American species of the Marmots, a genus of rodents. This animal, from 15 to 18 inches long, burrows in the earth, and often commits great havoc in fields of clover, of which it is very fond. The *prairie-dog* is allied to the marmots.

Wood′cock. A bird allied to the snipe, frequenting woods, and considered as game. It is nocturnal in its habits. The little woodcock is the snipe.

Wood′pecker. A bird having a hard pointed bill for pecking holes in trees, and a long tongue for drawing out insects from holes or crevices. This tongue is armed near the end with sharp barbs, pointed backward like a fish-hook. The tongue is fastened to cartilages which extend up to behind the skull and over the forehead, and in consequence of this it can be thrust out some distance beyond the beak. Apple and maple trees are sometimes pierced by the woodpecker's holes in rings one above the other, just as farmers pierce the maple. The nest is lodged in a pear-shaped hole made in a tree-trunk, much larger than the circular entrance at the top.

Wood-pulp. A fibrous material prepared from wood by grinding or by chemical means, and used, soaked in water, for making printing and other paper, and for various small wares, such as plates, basins, and pails. It has been used as a filling for car-wheels, in making bricks and tiles, etc., and even for making an imitation silk thread.

Wool. [AS.] The natural covering of certain animals, the best known of which is the sheep. The sheep is a tame or domestic animal, but in certain countries, as Asia, North America, and in parts of Europe (Sardinia and Corsica), wild sheep still abound. The entire coat of wool growing on any one sheep is called its fleece. This fleece is usually cut off or shorn once a year. The countries producing most wool are England, Australia, Cape Colony, Saxony, Spain, United States, and Mexico. Wool is remarkable for its softness, and the wavy nature of the separate fibres. When the fibres are drawn through the fingers in one direction, they feel smooth; but in the opposite direction they are rough, and seem to catch. The wool, being cut and carefully prepared, is spun into yarn by a machine which twists the fibres together, so as to form them into a long thread; the waviness of the fibres and the projecting scales help them to hold firmly together. The yarn is then woven into cloth. Any piece of woolen stuff consists of two sets of threads—one set called the warp, running the long way of the piece; and another set called the weft, running across, and interlacing with the warp. Lastly, the woolen cloth, as we may now call it, is dyed and pressed; the nap is raised by a process called teaseling, and the material is then ready to be made into clothes. When wool is spread out in a thin layer, well moistened, and then beaten smartly with a rod, the fibres become matted together, and form a material called *felt*, of which hats, carpets, etc., are made. Wool is a bad conductor of heat, and so prevents its escape from the body. At the same time wool is a good absorber of moisture, soaking up the perspiration as soon as it comes out of the skin. Owing to the roughness of the fibres, woolen materials gently chafe or rub the skin, and so promote its healthy action.

Worm. [AS. *wyrm*, a worm or snake.] Earthworms are humble animals, yet they are valuable aids to the agriculturist. On making a section down through the earth for several feet, there will be found innumerable tunnels formed by worms. A naturalist considers that they average 100,000 to the acre, and in especially rich ground in New Zealand it was estimated that there were 348,840 in a single acre. This vast body of worms is continually at work boring this way and that, coming to the surface during the night and retreating to greater depths during the day; and their tunnels constitute a system of irrigation and ventilation. Rain, instead of running off, enters the holes, and so penetrates the earth, thus being held for a longer time. Air also finds its way below the surface. But this is a very small part of the work accomplished. Worms are continually swallowing the earth and depositing it at the surface, and working it over and over. Darwin states that the vegetable mold thus transported in some places amounts to ten tons an acre. Worms not only carry all this material to the surface, but they drag vast quantities of leaves and other matter down that serve to enrich the soil and render it capable of producing larger crops. Some worms are a foot in length. Their bodies are formed of a large number of rings. On each ring there are a great many bristles. Grubs move forward by means of their tiny feet, snakes by means of their scales, and worms by means of their bristles. Their bodies are very elastic. The worm pushes forward its head, the bristles in the front part of its body take hold of the ground, and the rest of the body is then pulled along. In addition to the earth-worms, the name worm is applied to a large variety of elongated water animals, very many of them dwelling in the ocean, also to numerous internal parasites, some of which dwell in the human body. (See *Tape*.)

Worst′ed. [From Worsted or Worstead, a village in Norfolk.] Wool twisted into thread used for knitting stockings. Long yarn is made by drawing, gilling, and combing. Short wools are first carded and afterwards combed. Worsted for carpet-yarns or knitting-yarns is carded only.

Wort. [AS.] A plant of the Cabbage kind; also the sweet liquor obtained by steeping crushed grain in hot water, which ferments and forms beer (*q.v.*).

Wren. [AS.] A small brown bird having active and lively habits. It has a domed nest needlessly large for the size of the bird, and near an occupied nest are generally one or more nests unfinished. It is extensively found in Europe, and inhabits Palestine. The winter wren and house wren are common in North America. In Britain there are the wood wren and willow wren; also the chiff-chaff, which, from its nest, is sometimes called "oven" bird. Wrens, like robin redbreasts, whistle all the year round, times of hard frost excepted.

Y

Yacht. [Du.] A swift, light boat fitted up for pleasure-sailing or for racing. Yacht-racing dates from the beginning of the nineteenth century, during which it was greatly developed. Important international yacht-races took place between England and the United States, in nearly all of which the latter was victorious.

Yak. [Tibetan.] A large ox, very sure-footed, found in the plains of Central Asia. It is like the long-horned Scottish cattle, but more strongly built. In color it is black, and it has long hair, especially at the hind quarters, where it touches the ground. The wild yak is found always just under the snow-line; the tame yak is seldom employed below 12,000 feet above sea-level. The tails of domestic yaks are employed in India as fly-flaps.

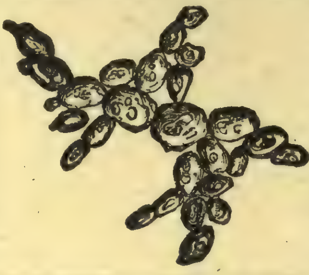
Yam. A large plant, with roots somewhat like the potato, grown in warm countries. The clusters of flowers are separately small, but together are showy. Most yams contain an acrid matter which is lost in cooking. The true yam is sometimes confused with the sweet potato, which is convolvulus.

Yarn. [AS.] The fibre of cotton, flax, hemp, silk, or wool spun into threads. Throughout all the changes of modern yarn-spinning, the rotating spindle continues to be the chief implement.

Yawl. [Du.] A small ship's boat rowed with four or six oars.

Year. [AS.] The time which the earth takes to go round the sun. The *tropical year* is the interval between two successive passages of the sun through the first point of Aries. Its mean length is 365 days 5 hrs. 48 min. 49.7 sec. Owing to the precession of the equinoxes it is shorter than the *sidereal year*, which is the interval which elapses between the time of the earth's leaving a given point in its orbit and the time of its returning to it. It consists of 365 days 6 hrs. 9 min. 9.6 sec. The order of the seasons is determined by the tropical year. The year is accounted 365 days in length, except every fourth year, which is named *leap year* and has 366 days. As this would make the average year rather too long, the last year of the century is not leap year unless its unit number can be divided by four. Thus 1900 was not leap year, but 2000 will be.

Yeast. [AS.] The froth that rises on the top of liquors in the process of fermentation; or the substance used for raising dough to be baked into bread (*q. v.*). Although yeast looks like a liquid to the naked eye, yet under the microscope a drop of yeast is found to contain thousands of extremely small rounded bodies, which are tiny plants of the Fungus kind. The yeast-plant feeds on part of the *starch* in the flour, and the result is that this starch is changed into grape-sugar. Leaven is only a little flour and water which has been left exposed to the air until some of the "spores" or "seeds" of the yeast-plant (which are always floating about in the air) have settled in it and begun to grow, which they do with wonderful rapidity.


YEAST FUNGUS, MAGNIFIED 400 TIMES.

Yellow Bird. This bird is known as the American Gold-finch or Thistle-bird. It is generally distributed over North America. The male is bright yellow, with black tail and wings marked with white and with black on top of the head; the female is yellowish brown above and darker brown below. They are usually seen in flocks, feeding on the seeds of thistles, sunflowers and other plants.

Yel′low-hammer. A British song-bird with yellow feathers. This bird breeds late, and continues to sing until late in the year.

Yew. [AS.] An evergreen tree like the pine, used either in hedges or separately. Its wood is hard and close-grained, and its young branches, owing to their toughness, were formerly much used for bows. Old yews are common near churches. The leaves have poisonous properties.

Yolk or Yelk. [AS.] The yellow part of an egg. It has a thin skin around it, and has in it a little jelly-like germ, from which the young bird develops. (See *Egg*.)

Yuc′ca. [Span.] A kind of lily peculiar to North America. Some kinds have underground stems and dagger-like leaves; others have palm-like stems crowned with dense tufts of leaves. They yield coarse fibres used for ropes and cloth, and are grown as ornamental plants. The plant is popularly called "Adam's Needle."

Yule. [AS.] The old English word for Christmas, still used in provincial parts of England. The bringing in of the *Yule log*, for burning on the Christmas hearths, was a festive ceremony.

Z

Ze'bra. [Port.] A kind of wild ass, of the genus *Equus*, perhaps the most beautiful animal of this tribe. It is pale yellow or white in color,

with black or brown stripes. It lives in large herds in the mountainous parts of Africa, and is very wild. Few zebras have ever been tamed.

Ze'bu. [Fr.] A variety of the Ox family with short horns, long ears, and a large hump over the shoulders, found in India and the Asiatic islands, and along the east coast of Africa. Some are of large size and others as small as a sheep.

Ze'nith. [Fr., from Arab.] The point in the celestial sphere which a person standing on the earth at any point sees directly overhead; directly opposite to the *nadir*.

Zinc. A metal of a bluish-white color, having a crystalline structure. It is brittle at ordinary temperatures, but when heated it becomes malleable, and does not lose this quality when cooled. If raised to a red heat in a closed vessel, it will boil and pass off in vapor, and when heated in the air it burns with a bright flame. When exposed to damp air, a thin coating of rust is formed, which prevents the further oxidation of the metal. Combined with copper, it forms the alloy brass, and it also forms an ingredient in German silver. In the metallic state it is used for roofing, for rain-pipes, for gutters, and as a coating for sheet-iron and iron wire. Iron covered with zinc in this way is known as *galvanized* iron. Zinc is also used in some electric batteries; and as an oxide it is employed as a pigment.

Zo'diac. A broad belt running round the heavens parallel to the ecliptic, and extending about 8° on each side of it. It is the area within which the motions of the sun, moon, and the greater planets lie. The stars in the zodiac have been divided into twelve groups called constellations—Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, Pisces. These divisions do not now coincide with the constellations as formerly; for by the precession of the equinoxes they have been moved back about 25° behind the constellations.

Zodiacal Light. A remarkable luminous appearance in the sky, seen in the west after sunset, and in the east before sunrise, at certain seasons of the year. It is a triangle of light, of greatest intensity within the tropics, where its brilliancy sometimes rivals that of the Milky Way. It stretches through the sky nearly in the direction of the sun's equator. It is only during the spring and autumn that in our latitudes it can attain sufficient height in the sky to be distinguishable.

ABBREVIATIONS.

The following are the most common abbreviations used in this book:

Arab. or Ar.	*Arabic.*
AS.	*Anglo Saxon.*
Braz.	*Brazilian.*
Celt.	*Celtic.*
Chin.	*Chinese.*
Cor.	*Corresponding.*
Dan.	*Danish.*
Du.	*Dutch.*
Fr.	*French.*
G.	*German.*
Gk.	*Greek.*
Goth:	*Gothic.*
H	*Hayti.*
Heb.	*Hebrew.*
Hind.	*Hindu.*
Icel.	*Icelandic.*
Ital.	*Italian.*
L.	*Latin.*
L. Lat.	*Low Latin.*
Malay	*Malayan.*
O. E.	*Old English.*
O. F.	*Old French.*
Pers.	*Persian.*
Pl.	*Plural.*
Port.	*Portuguese.*
q. v.	*which see.*
Sax.	*Saxon.*
Scand.	*Scandinavian.*
Sing.	*Singular.*
Sp. or Span.	*Spanish.*
Swed.	*Swedish.*
Turk.	*Turkish.*
W. Ind.	*West Indies.*

BOOK II

THE HOME CYCLOPEDIA

OF

BUSINESS AND COMMERCE

PRACTICAL HELPS IN GRAMMAR—SPELLING AND COMPOSITION—LESSONS IN PENMANSHIP WITH MODEL COPIES—FORMS FOR ALL KINDS OF BUSINESS PAPER—MONEY AND BANKING—BOOKKEEPING PRACTICALLY ILLUSTRATED—HOW TO USE FIGURES QUICKLY—BUSINESS LAW—A VOCABULARY OF COMMON BUSINESS TERMS.

A PRACTICAL BUSINESS INSTRUCTOR AND GUIDE

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AND OTHER SPECIALISTS.

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HOME CYCLOPEDIA OF BUSINESS

The Language We Speak

ITS INTERESTING HISTORY—ITS FORMATION—ITS MILESTONES —ITS DIVISIONS BY POINTS—ITS GRAMMAR—ITS SPELLING—ITS CORRECT USE—ITS FLOWERS OF SPEECH

OUR MOTHER TONGUE

Language has a history just as the living being who uses it. It has gone through periods of change and development which correspond to the many changes in the history of the race from the few words or sounds of man who lived in the cave to the complete vocabulary of the most learned American. It is of first importance to every one aspiring to success in the correct use of our language to appreciate fully what a wonderful instrument it is. This requires that a brief account be given of its history and composition.

We speak of the "English tongue" or of the "French language"; and we say of two nations that they "do not understand each other's speech." The existence of these three words—*speech*, *tongue*, *language*—proves to us that a language is something *spoken*,—that it is a number of *sounds;* and that the writing or printing of it upon paper is a quite secondary matter. Language, rightly considered, then, is an *organized set of sounds*. These sounds convey a meaning from the mind of the speaker to the mind of the hearer, and thus serve to connect man with man.

It took many hundreds of years—perhaps thousands—before human beings were able to invent a mode of writing upon paper—that is, of representing *sounds* by *signs*. These signs are called *letters;* and the whole set of them goes by the name of the *Alphabet*—from the two first letters of the Greek alphabet, which are called *alpha*, *beta*. There are languages that have never been put upon paper at all, such as many of the African languages, many in the South Sea Islands, and other parts of the globe. But in all cases, every language that we know anything about—English, Latin, French, German—existed for a long time before any one thought of writing it down on paper.

Curious Changes in Language.

Our language has grown; it is growing still; and it has been growing for many hundreds of years. As it grows it loses something, and it gains something else; it alters its appearance; changes take place in this part of it and in that part,—until at length its appearance in age is something almost entirely different from what it was in its early youth. If we had the photograph of a man of forty, and a photograph of the same person when he was a child of one, we should find, on comparing them, that it was almost impossible to point to the smallest trace of likeness in the features of the two photographs. And yet the two pictures represent the same person. And so it is with the English language. The oldest English,

which is usually called Anglo-Saxon, is as different from our modern English as if they were two distinct languages; and yet they are not two languages, but really and fundamentally one and the same. Modern English differs from the oldest English as a giant oak does from a small oak sapling, or a broad stalwart man of forty does from a feeble infant of a few months old.

The English language is spoken by the Anglo Saxon race in all parts of the world, including England, most parts of Scotland, the larger part of Ireland, the United States, Canada, Australia, New Zealand, and South Africa. In the middle of the *fifth* century it was spoken by a few thousand men who had lately landed in England from the Continent; it is now spoken by nearly *two hundred millions of people*. In the course of the next one hundred years, it will probably be the speech of three hundred millions.

The Family of our English Language.

Our English tongue belongs to the *Aryan* or *Indo-European Family* of languages. That is to say, the main part or substance of it can be traced back to the race which inhabited the high table-lands that lie to the back of the western end of the great range of the Himalaya, or "Abode of Snow." This Aryan race grew and increased, and spread to the south and west; and from it have sprung languages which are now spoken in India, in Persia, in Greece and Italy, in France and Germany, in Scandinavia, and in Russia. From this Aryan family we are sprung; out of the oldest Aryan speech our own language has grown.

Our own language has been in the process of formation for centuries, and that it still is changing and adding new words indicates it has vitality and is a living language. A language is said to be *dead* when it is no longer spoken. Such a language we know only in books. Thus, *Latin* is a dead language, because no nation anywhere now speaks it. A dead language can undergo no change; it remains, and must remain, as we find it written in books. But a living language is always changing, just like a tree or the human body. The human body has its periods or stages. There is the period of infancy, the period of boyhood, the period of manhood, and the period of old age. In the same way, a language has its periods.

We divide the English language into periods, and then mark, with some approach to accuracy, certain distinct changes in the habits of our language, in the inflexions of its words, in the kind of words it preferred, or in the way it liked to put its words together. But we must be carefully on our guard against fancying that, at any given time or in any given year, the English people threw aside one set of habits as regards language, and adopted another set. It is not so, nor can it be so. The changes in language are as gentle, gradual, and imperceptible as the changes in the growth of a tree or in the skin of the human body. We renew our skin slowly and gradually; but we are never conscious of the process, nor can we say at any given time that we have got a completely new skin.

—Bearing this caution in mind, we can go on to look at the chief periods in our English language. These are five in number: and they are as follows:—

I.	Ancient English or Anglo-Saxon,	449–1100
II.	Early English,	1100–1250
III.	Middle English,	1250–1485
IV.	Tudor English,	1485–1603
V.	Modern English,	1603–1900

These periods merge very slowly, or are shaded off, so to speak, into each other in the most gradual way. If we take the English of 1250 and compare it with that of 900, we shall find a great difference; but if we compare it with the English of 1100 the difference is not so marked. The difference between the English of the twentieth and the English of the fourteenth century is very great, but the difference between the English of the fourteenth and that of the thirteenth century is very small.

The Grammar of the Language

Was fixed before the seventeenth century, most of the case-endings having entirely vanvanished. The vocabulary of the language, however, has gone on increasing, and is still increasing; for the English language, like the English-speaking peoples, is always ready to offer hospitality to all peaceful foreigners —words or human beings— that will land and settle within their coasts. And the

tendency at the present time is not only to give a hearty welcome to newcomers from other lands, but to call back old words and old phrases that had been allowed to drop out of existence. Tennyson, Lowell and other of our modern writers have been among the chief agents in this happy restoration.

The Vocabulary Increased.

When the Angles or English went over to the British Isles in the fifth century, the number of words in the language they spoke was probably not over *two thousand*. Now, however, we possess a vocabulary of perhaps more than *one hundred thousand words*. And so eager and willing have we been to welcome foreign words, that it may be said with truth that: *The majority of words in the English Tongue are not English*. In fact, if we take the Latin language by itself, there are in our language more *Latin* words than *English*. But the grammar is distinctly English, and not Latin at all.

We must not forget what has been said about a language,—that it is not a printed thing—not a set of black marks upon paper, but that it is in truest truth a *tongue* or a *speech*. Hence we must be careful to distinguish between the *spoken* language and the *written* or *printed* language; between the language of the *ear* and the language of the *eye;* between the language of the *mouth* and the language of the *dictionary;* between the *moving* vocabulary of the market and the street, and the *fixed* vocabulary that has been catalogued and imprisoned in our dictionaries. If we can only keep this in view, we shall find that, though there are more Latin words in our vocabulary than English, the English words we possess are *used* in speaking a hundred times, or even a thousand times, oftener than the Latin words. It is the genuine English words that have life and movement; it is they that fly about in houses, in streets, and in markets; it is they that express with greatest force our truest and most usual sentiments—our inmost thoughts and our deepest feelings. Latin words are found often enough in books; but, when an English man or woman is deeply moved, he speaks pure English and nothing else. Words are the coin of human intercourse; and it is the native coin of pure English with the native stamp that is in daily circulation.

How Strange Words Come In.

The different peoples and the different circumstances with which our race has come in contact, have had many results—one among others, that of presenting us with contributions to our vocabulary. Kelts were found in England; and hence we have a number of Keltic words in our vocabulary. The Romans held the island for several hundred years; and when they had to go in the year 410, they left behind them a few Latin words, which we have inherited. In the seventh century, Augustine and his missionary monks from Rome took over a larger number of Latin words; and the Church which they founded introduced even more and more words from Rome. The Danes began to go over to England in the eighth century; there was for some time a Danish dynasty seated on the throne of England; and hence there are many Danish words. The Norman-French invasion in the eleventh century took over many hundreds of Latin words; for French is in reality a branch of the Latin tongue. The Revival of Learning in the sixteenth century gave us several thousands of Latin words. And wherever English-speaking sailors and merchants have gone, they have brought back with them foreign words as well as foreign things—Arabic words from Arabia and Africa, Hindustani words from India, Persian words from Persia, Chinese words from China, and even Malay words from the peninsula of Malacca.

SPANISH WORDS.—The words we have received from the Spanish language are not numerous, but they are important. The following are a few of them:—

Alligator, Armada, Barricade, Battledore, Bravado, Buffalo, Cargo, Cigar, Cochineal, Cork, Creole, Desperado, Embargo, Filibuster, Flotilla, Grenade, Guerilla, Indigo, Merino, Mosquito, Mulatto, Negro, Octoroon, Quadroon, Renegade, Savannah, Tornado, Vanilla.

ITALIAN WORDS.—Italian literature has been read and we owe to the Italian language a large number of words. The following are a few of the more common ones:—

Alarm, *Alert*, *Alto*, *Balcony*, *Bandit*, *Bankrupt*, *Bravo*, *Brigade*, *Brigand*, *Bust*, *Cameo*, *Canteen*, *Canto*, *Carnival*, *Cartoon*, *Cascade*, *Citadel*, *Concert*, *Cornice*, *Corridor*, *Cupola*, *Ditto*, *Domino*, *Folio*, *Fresco*, *Gazette*, *Granite*, *Guitar*, *Incognito*, *Influenza*, *Lava*, *Madonna*, *Malaria*, *Manifesto*, *Motto*, *Moustache*, *Niche*, *Opera*, *Pantaloon*, *Pianoforte*, *Piazza*, *Portico*, *Ruffian*, *Serenade*, *Sonnet*, *Soprano*, *Stanza*, *Studio*, *Tenor*, *Trombone*, *Umbrella*, *Vista*, *Volcano*.

DUTCH WORDS.—The Dutch are a great seafaring people and have given us a number of words relating to the management of ships. The following are a few words which we owe to the Netherlands:—

Ballast, *Boom*, *Boer*, *Hoy*, *Luff*, *Reef*, *Skates*, *Skipper*, *Sloop*, *Smack*, *Smuggle*, *Yacht*, *Yawl*.

It will be interesting to note a few words which come directly from the Latin:

Antecessor, *Benediction*, *Cadence*, *Captive*, *Conception*, *Coffin*, *Corpse*, *Debit*, *Dilate*, *Example*, *Fabric*, *Faction*, *Fact*, *Fidelity*, *Fragile*, *Gentile*, *History*, *Hospital*, *Legal*, *Master*, *Mint*, *Nutriment*, *Oration*, *Particle*, *Pauper*, *Penitence*, *Persecute*, *Quiet*, *Radius*, *Regal*, *Respect*, *Secure*, *Senior*, *Separate*, *State*, *Tract*, *Tradition*, *Zealous*.

Also that the following come to us from the Latin through the French:

Ancestor, *Benison*, *Chance*, *Caitiff*, *Conceit*, *Coffer*, *Corps*, *Debt*, *Delay*, *Sample*, *Forge*, *Fashion*, *Feat*, *Fealty*, *Frail*, *Gentle*, *Hotel*, *Loyal*, *Mr.*, *Money*, *Nourishment*, *Orison* (a prayer), *Parcel*, *Poor*, *Penance*, *Pursue*, *Story*.

Scientific Terms.

A very large number of discoveries in science have been made in this century; and a large number of inventions have introduced these discoveries to the people, and made them useful in daily life. Thus we have *telegraph* and *telegram*; *photograph*; *telephone* and even *photophone* and *megaphone*. The word *dynamite* is also modern. Then passing fashions have given us such words as *athlete* and *æsthete*. In general, it may be said that, when we wish to give a name to a new thing—a new discovery, invention, or fashion—we have recourse not to our own stores of English, but to the vocabularies of the Latin and Greek languages.

The English Language for Ten Centuries.

We can mark out a few guide posts in the path of ten centuries traversed by our language each distinguished by a great event. A reference to any good History of England will give the reader particulars which will be fascinating and instructive. We give a few of the important events and dates which we should endeavor to remember.

1. *King Alfred* translated several Latin works into English, among others, Bede's 'Ecclesiastical History of the English Nation' . . . . . . (851) 901
2. *The Norman Conquest*, which introduced Norman-French words 1066
3. *Anglo-Saxon Chronicle*, said to have been begun by King Alfred, and brought to a close in 1160
4. *Sir John Mandeville*, first writer of the newer English Prose—in his 'Travels' which contained a large admixture of French words 1356
5. *Wyclife's Bible* 1380
6. *Geoffrey Chaucer*, the first great English Poet, author of the 'Canterbury Tales'; born in 1340, died 1400
7. *William Caxton*, the first English printer, brings out in Germany the first English book ever printed 1471
8. *First English Book* printed in England (by Caxton) the 'Game and Playe of the Chesse' 1474
9. *William Tyndale*, by his translation of the Bible "fixed our tongue once for all." His New Testament has become the standard of our tongue: the first ten verses of the Fourth Gospel are a good sample of his manly Teutonic pith" . . . 1526-30
10. *Edmund Spencer* publishes his 'Faerie Queene.' "Now began

the golden age of England's literature; and this age was to last for about fourscore years" 1590

11. *Our English Bible*, based chiefly on Tyndale's translation. "Those who revised the English Bible in 1611 were bidden to keep as near as they could to the old versions, such as Tyndale's" . 1611
12. *William Shakespeare* carried the use of the English language to the greatest height of which it was capable. He employed 15,000 words. (Born 1564) . 1616
13. *John Milton*, "the most learned of English poets," publishes his 'Paradise Lost,'—"a poem in which Latin words are introduced with great skill" . . . 1667
14. *John Bunyan* writes his 'Pilgrim's Progress'—a book full of pithy English idiom. "The common folk had the wit at once to see the worth of Bunyan's masterpiece, and the learned long afterwards followed in the wake of the common folk" (Born 1628) 1688
15. *Dr. Samuel Johnson* was the chief supporter of the use of the "long-tailed words in *osity* and *action*," such as his novel called 'Rasselas,' published, ... 1759
16. *Tennyson*, Poet-Laureate, a writer of the best English—"a countryman of Robert Manning's, and a careful student of old Malory, has done much for the revival of pure English among us" 1890

THE GRAMMAR OF THE ENGLISH LANGUAGE.

Whatever may be said of the English language in other respects, in simplicity it undoubtedly surpasses the rest of European tongues. It is free from intricacies of case, declension, mood, and tense. Its words are subject to but few terminational changes. Its substantives have no distinctions of gender except what nature has made. Its adjectives admit of such changes only as are necessary to denote the degrees of comparison. Its verbs, instead of running through all the varieties of ancient conjugation, suffer few changes. With the help of prepositions and auxiliaries, all possible relations are expressed, while the words for the most part retain their forms unchanged. We lose from this, no doubt, in brevity and strength; but we gain vastly in simplicity. The arrangement of our words is, in consequence, less difficult, and our sentences are more readily understood. The rules of our syntax are exceedingly simple, and the acquisition of our language is easy in proportion.

Parts of Speech.

Having traced briefly the history of our language, considered some of the sources from which it is derived, and noted its chief characteristics, we shall now proceed to treat of its words, viewed with reference to the respective parts they perform in a sentence. Some knowledge of grammar from text-books being presupposed, we shall here, by a brief summary, merely recall to mind its leading principles, with such definitions and illustrations only as are absolutely essential for practical purposes.

The classes into which words are divided with reference to their use and mutual relations, are called PARTS OF SPEECH. They are nine in number.

NOUNS are names of things. They are divided into two classes: COMMON NOUNS, or names that distinguish one class of objects from another—as *girl*, *lake*, *book;* and PROPER NOUNS, or names that distinguish one individual of a class from another, as *Rome*, *John*.

The term SUBSTANTIVE is frequently used as synonymous with *noun*. Besides nouns, it embraces whatever may be used as such; that is, pronouns, verbs in the infinitive, and clauses.

To nouns belong (a) Gender; masculine, feminine and neuter.

(b) Number: singular and plural.

(c) Case: nominative, possessive, objective and vocative.

PRONOUNS are words that may be used instead of nouns.

They are comprised in the following classes:—

1. PERSONAL, or such as show by their form what person they are; that is, whether they represent the person speaking, the person spoken to, or the object spoken of. The Personals are,

I, *thou*, *he*, *she*, *it*, and their compounds, *myself*, *thyself*, *himself*, *herself*, *itself*.

2. POSSESSIVE, such as denote possession. They are: *Substantive possessive: Mine*, *thine*, *his*, *hers*, *ours*, *yours*, and *theirs*, *Adjective possessive: my*, *thy*, *his*, *her*, *our*, *your*, *their*.
3. RELATIVES, or such as relate to a substantive going before, called an antecedent. The relatives are, *who*, *which*, and *that*. *What*, *whatever*, *whoever*, and *whichever*, include the antecedent, and are called compound relatives.
4. INTERROGATIVES, or such as are used to ask questions. The interrogatives are, *who*, *which* and *what*.
5. ADJECTIVE PRONOUNS, or such as on some occasions take the place of substantives, and on others are used with them, like adjectives. Under this head fall the words, *this*, *that*, *each*, *every*, *either*, *neither*, *no*, *none*, *any*, *all*, *such*, *some*, *both*, *other*, *another*.

ADJECTIVES are words which describe or limit substantives; as, The *ten great* authors.

The ARTICLES are included as adjectives and are placed before nouns to show whether they are used in a particular or general sense. We have two articles, *the*, called DEFINITE, and *an* or *a*, called INDEFINITE.

VERBS or words that express an action or state; as, "He *is* sure *to succeed*." That respecting which the action or state is primarily expressed is called the SUBJECT of the verb; thus, in the preceding example, *he* is the subject of the verb *is*.

Verbs are divided into two classes: TRANSITIVE, or such as express an act done to an object; and INTRANSITIVE, or such as express a state, or an act not done to an object. "James *reads* Latin," "James *can swim*," "James *is* asleep"; in the first sentence the verb is transitive; in the last two, intransitive.

To show the relation which the subject bears to the action expressed, transitive verbs have two distinct forms, called VOICES. The ACTIVE VOICE represents the subject of the verb as acting; as, "Cæsar *conquered* Pompey." The PASSIVE VOICE represents the subject of the verb as acted upon; as, "Pompey *was conquered* by Cæsar."

To verbs belong person, number, Mood, Tense, and Voice. In person and number the verb agrees with its subject.

Mood, or *Mode*, is the form of the verb which shows the manner of the action or condition expressed. The English verb has five moods: *indicative*, *potential*, *subjunctive*, *infinitive* and *imperative*.

The INDICATIVE mood expresses an absolute affirmation.

The POTENTIAL mood expresses possibility, inclination, ability, duty. Its signs are the auxiliary verbs, *may*, *can*, *must*, *might*, *could*, *would*, *should*.

The SUBJUNCTIVE expresses a condition. Its ordinary sign is *if*.

The INFINITIVE mood expresses action or condition without restriction of number or person. A verb in the infinitive mood has no subject, and consequently can make no affirmation.

The IMPERATIVE mood expresses a command.

Tense is the form of the verb which indicates the time of the action or condition.

The English verb has six tenses, the *present*, *perfect*, *present perfect*, *pluperfect*, *future*, and *future perfect*.

The PRESENT tense expresses a present action or condition; "It freezes."

The PERFECT tense expresses what took place, or was taking place in time past; "It froze." "It was freezing."

The PRESENT PERFECT tense expresses an action or condition indefinitely passed; "It has frozen."

The PLUPERFECT tense expresses what had occurred before some time past; "It had frozen before my departure."

The FUTURE tense expresses what will happen in future time; "It will freeze."

The FUTURE PERFECT tense expresses what will have happened after some future time specified or implied; "It will have frozen by four o'clock."

PARTICIPLES, are words which, partaking of the nature of adjectives and verbs, describe a substantive by assigning to it an action or a state. Transitive verbs have six participles, three in the active, and three in the passive, voice; as, *loving*, *loved*, *having loved*, and *being loved*, *loved*, *having been loved*. Intransitive verbs, admitting of no passive voice, have but three participles; as, *walking*, *walked*, *having walked*.

ADVERBS, are words added to verbs, participles, adjectives, and other adverbs, to express time, place, degree, comparison, manner, &c.; as, *now*, *here*, *very*, *so*, *gracefully*. Adverbs of manner for the most part end with the letters *ly*. This class of words must be carefully distinguished from adjectives, which also express manner or quality, but are always joined to substantives.

CONJUNCTIONS, used to connect words, sentences, and parts of sentences. The most common are,

and,	but,	if,	or,	though,
as,	except,	lest,	since,	unless,
although,	either,	nor,	that,	whether,
because,	for,	neither,	than,	yet,

PREPOSITIONS, which show the relations between substantives and other words in a

sentence. The following list contains the most common ones :

about,	at,	by,	into,	through,
above,	before,	down,	out of,	to,
across,	behind,	during,	of,	touching,
after,	below,	except,	off,	upon,
against,	beneath,	for,	on,	with,
along	beside,	from,	over,	within,
among,	between,	in,	save,	without.

INTERJECTIONS are used to denote a sudden emotion of the mind ; as, *ah*, *alas*, *O*, *oh*, *fie*, *hist*, &c.

Of these parts of speech, the noun, pronoun, and verb alone are inflected ; that is, undergo changes in termination to denote different cases, numbers, persons, &c.

That we may determine to which of the above classes a word belongs, we must examine the relations it sustains to the rest of the sentence ; and, as in different connections the same word often performs very different offices, it follows that in one sentence it may be one part of speech, and in another, another, according to its application. Reference to the dictionary and the meaning of the word will help decide the class to which a word belongs.

About Sentences.

All written or spoken language arranges itself into sentences which are described as assemblages of words which make complete sense ; as, "God is love."

Every sentence consists of two parts, subject and predicate.

The SUBJECT is that respecting which something is affirmed. In the above example, *God* is the subject.

The Predicate is that which is affirmed respecting the subject. In the above example, the words *is love* constitute the predicate.

As regards their signification, sentences are divided into four classes ; viz., Declarative, Interrogative, Imperative, and Exclamatory.

A Declarative Sentence is one that declares something. *The sun shines*.

Declarative sentences constitute the greater part of written language.

An Interrogative sentence is one that asks a question, and is generally introduced by an interrogative pronoun, *who*, *which*, or *what;* or, by an auxiliary, *do*, *am*, *have*, *shall*, *may*, &c.

An Imperative sentence is one that expresses a command, an exhortation, an entreaty, or permission, and is generally introduced by a verb in the imperative mood, *let* being often used for that purpose; as, "Go in peace ;" "Let him arise." The subject of an imperative sentence is often understood.

An Exclamatory Sentence is one that exclaims something ; as "How it snows !"

As regards their construction, sentences are divided into three classes, Simple, Compound and Complex. Simple sentence are such as make complete sense when used alone.

Compound Sentences are such as have two or more simple sentences.

Complex Sentences are such as have a principal or independent sentence modified by one or more subordinate clauses or sentences.

Mistakes in Grammar

When words are used in improper forms, as "seen" for "saw," and "done" for "did," or when the use of one word is confused with that of another, we say that the user is ungrammatical and ignorant. A moderate knowledge of the grammar will enable every one to speak and write ordinary sentences correctly. But this should be supplemented by careful observation of the usage of the best writers and speakers. One should correct his own mistakes when discovered, and exercise care in not repeating these mistakes. Note the following errors which are to be avoided and test your own language and productions to see that they are clear of these errors.

1. Do not use the objective in place of the nominative ; as, "Him and me did it." Say "He and I."

2. Do not use the nominative for the objective of the pronoun ; as, "*who* are you looking for ?" instead of *whom*. This is an error that can always be avoided by putting the preposition at the beginning of the sentence, not at the end : as, "For *whom* are you looking ?"

3. Do not use *like* instead of *as ;* "She looked like [as] she did a year ago."

4. Do not use *them* for *those*, or *this here* for *this;* as "Give me them books."

5. Do not use *done* for *did*, *seen* for *saw*, *has went* for *has gone*, and similar improper forms of verbs.

6. Do not confuse use of each other and one another. The former should only be used in reference to two persons: "Let us all then promise each other [one another.]"

7. Do not confuse a transitive verb with an intransitive. Say "I lie, lay or have lain on the sofa" and "I lay, laid or have laid the book on the table." So also in the use of *sit* and *set*, *raise* and *rise*, *lean* and *teach*, and other verbs.

8. Do not use singular form of a verb with plural subject or more than one subject; as "The man and woman is at the door;" "The theatres is crowded."

9. Do not use a plural verb with a singular subject. This mistake often happens when a plural noun or two connected singular nouns are connected with the subject; as, "The Story of all his adventures and wanderings make [makes] an interesting book."

10. Do not use two negatives instead of one; as, "I didn't see no one."

11. Do not say don't for doesn't in the third person singular of the present indicative; as "It don't [doesn't] matter." "He don't [doesn't] know." This is a mistake of frequent occurrence even among cultured people.

12. Do not use adjectives for adverbs in "ly"; say, "The birds fly swiftly" not "swift," and "He writes well" not "good." On the other hand do not use adverbs in "ly" for adjectives; say "She looks beautiful," not "beautifully."

13. Avoid the use of slang; as, "You bet," "level best," "go it blind" and similar expressions.

14. Do not use Superlative of the adjectives when Comparative is required; say "He is the stronger of the two," not "strongest."

How to Use Capital Letters

It is of the greatest importance that the Capital Letters be used correctly and in accordance with some fixed rules, or otherwise the manuscript will have a very untidy appearance, and confusion in meaning may arise in the mind of the reader. The correct use of Capitals in letters is an art easily cultivated and will often be the means of securing favorable consideration for the one who pens the letter.

We here give the most important rules which, if followed, will secure correct use of Capital Letters.

The Small Letters of our Alphabet constitute the great bulk of all kinds of printed or written matter. Capitals, however, are employed in certain cases at the commencement of words, for the purpose of attracting special attention.

Begin with a Capital, (1) The first word of every sentence; (2) All proper nouns, and titles of office, honor, and respect; as, *Rome*, *Avenue*, *Mr. Chairman*, *Dr. Franklin*, *Gen. Washington*.

Under this head fall adjectives, as well as common nouns, when joined to proper nouns for the purpose of expressing a title; as, Alexander the *Great*, *King* William, *Good Queen* Bess.

(3) All adjectives formed from proper nouns; as, *Roman*, *Spanish*, *Elizabethan*.

(4) Adjectives denoting a sect or religion, whether formed from proper nouns or not; as, *Catholic*, *Protestant*, *Universalist*.

(5) Common nouns when spoken to, or spoken of, in a direct and lively manner, as persons, that is personified.

(6) The first word of every line of poetry; as,

"Should certain persons die before they sing."

(7) All appellations of the Deity, and the personal pronouns *he* and *thou* when standing for His name.

(8) The first word of a direct quotation; that is, one that forms a complete sentence by itself and is not connected with what precedes by *that*, *if*, or any other conjunction, as, "Remember the old maxim: 'Honesty is the best policy.'"

(9) The pronoun *I*, and the interjection *O*, must always be written with Capitals.

(10) Begin with a Capital every noun, adjective, and verb, in the titles of books and headings of chapters; as, "Hervey's '*Meditations* among the *Tombs.*'" "Ernest Seton Thompson's 'Wild Animals I Have Known.'"

Observe the difference between the interjections *O* and *oh*. The former is used only before

the names of objects addressed or invoked, is not immediately followed by an exclamation-point (!) and must always be a capital; the latter is used by itself to denote different emotions of the mind, has an exclamation-point after it, and begins with a Small Letter, except at the commencement of a sentence.

Use a Small Letter in all cases where one of these rules does not apply. When in doubt, use a Small Letter.

Use of Punctuation Marks

Punctuation may be called the art of dividing written language by points, in order that the relations of words and clauses may be plainly seen, and their meaning be readily understood.

In spoken language, these relations are sufficiently indicated by the pauses and inflections of the voice; but as written language has no such aids, it is necessary to supply the deficiency with arbitrary marks.

The ancients originally wrote their manuscripts without marks or divisions of any kind. Points are said to have been first used about 200 B. C., by Aristophanes, a grammarian of Alexandria, but did not come into general use for several centuries. The modern system of punctuation was invented by Manutius, a learned printer who flourished in Venice at the commencement of the sixteenth century. To him we are indebted for developing the leading principles of the art, though in some of their details they have since that time undergone considerable modification. As there is no man at whose hands business or friendship does not require an occasional letter, so there is none that need be unable, by a proper use of points, to make his meaning intelligible.

Good usage differs widely in regard to punctuation; it is therefore impossible to lay down any fixed rules on the subject. Let the following general principles with regard to punctuation be constantly borne in mind.

The principal use of points is to separate words and clauses, and indicate the degree of connection between them. Thus, clauses between which the connection is close must be separated by commas; those in which it is more remote by semicolons.

(2) They perform another office by showing to what class a sentence belongs. Thus, "George is well," followed by a period is a declarative sentence, asserting that George is in good health; followed by an interrogation-point, it is an interrogative sentence, and implies belief that he is well together with an inquiry whether it is not so; in other words, it is equivalent to "George is well; is he not?" This important difference of meaning can be conveyed in no other way than by the use respectively of the period and interrogation-point.

(3) Points are also employed to indicate a sudden transition or break in the construction or meaning. Thus, where a sentence is suddenly interrupted or broken off, a dash is placed; as, "Woe to the destroyer! woe to the——."

(4) Finally they are used to denote the omission of words. Such is the office of the commas in the following sentence: "Reading maketh a full man; conference, a ready man; writing, an exact man." The verb *maketh* being left out in the last two clauses, commas are inserted to denote the omissions.

(5) Never introduce a point unless you have some positive rule for so doing. Whenever there is any reasonable doubt as to the propriety of employing a comma, do not use it. The tendency of punctuators at the present day is to introduce too many points.

The characters used in punctuation are as follows:

Period,	.	Semicolon	;
Interrogation-Point,	?	Comma,	,
Exclamation-Point,	!	Dash,	—
Colon,	:	Parentheses,	( )
		Brackets,	[ ]

WHEN TO USE THE PERIOD. — The period should be used, (1) After every declarative and imperative sentence; as, "Honesty is the best policy."—"Fear God."

(2) After every abbreviated word; as, *Dr. Geo. F. Johnson, F. R. S.*

(3) After Roman capitals and small letters when used for figures; as "Charles I. was the son of James I."

THE COLON. — The colon is used to separate sentences which are only slightly connected and not completely separated as in the case of the period.

It is placed before a formal enumeration of particulars, and a direct quotation when

referred to by the words *thus*, *following*, *as follows*, *this*, *these*.

THE SEMICOLON.—The semicolon is used to separate sentences which are closely related in memory. (1) When several long clauses occur in succession, all having common dependence on some other clause or word, they must be separated by semicolons; as, "If we neglected no opportunity of doing good; if we fed the hungry and ministered to the the sick; if we gave up our own luxuries, to secure necessary comforts for destitute; though no man might be aware of our generosity, yet in the applause of our own conscience we would have an ample reward."

A semicolon must be placed between the great divisions of sentences, when minor subdivisions occur that are separated by commas; as, "Mirth should be the embroidery of conversation, not the web; and wit the ornament of the mind, not the furniture."

When a colon is placed before an enumeration of particulars, the objects enumerated must be separated by semicolons.

THE COMMA.—The comma is used in various ways to separate the parts of the sentence, and to facilitate the reader's comprehension of the sense. The rules for the employment of the comma are many, and as employed in letters, business forms, and in ordinary composition, only the more important of the rules are observed. Examples of its use are so frequent on this and other pages that special ones need not be given here.

(1) A comma is placed between the particulars mentioned in a succession of words all in the same construction.

(2) A comma is placed before and one after every parenthetical expression.

(3) A comma is placed after each pair of words, when each pair is in the same construction.

(4) A comma is used before a quotation closely connected with the preceding words.

(5) A phrase or clause which explains, in any degree, the meaning of any other phrase or clause is separated from it by a comma.

(6) A comma is placed where a word is understood, unless the connection is close.

(7) A comma must be used in sentences which would otherwise be misunderstood.

(8) Expressions repeated must be separated by a comma.

(9) All modifying expressions, unless closely connected with the rest of the sentence, are separated by commas.

(10) Use the comma in all places where its use will tend to make the sense clearer, and where no other mark of punctuation is applicable.

EXCLAMATION AND INTERROGATION POINTS.—The use of Exclamation and Interrogation points is governed by a very few rules of easy application.

(1) An exclamation point is placed after every sentence, clause, phrase or word expressing sudden or violent emotion.

(2) Where special emphasis is required, several exclamation points may be used.

(3) An exclamation point, enclosed in parenthesis, is used to denote surprise.

(4) An interrogation point is placed after every sentence, phrase, clause, or word, which asks a direct question.

(5) An interrogation point enclosed in parenthesis is often used to denote doubt.

THE USE OF QUOTATION AND OTHER MARKS.—(1) Quotation marks are placed before and after words or passages quoted from another author, or represented in narratives as used in dialogue.

(2) Quotations consisting of more than one paragraph have the first quotation mark at the beginning of each paragraph, but the second is used only at the end of the last paragraph.

(3) When a quoted passage requires special attention, the first quotation mark may be used at the commencement of each line.

(4) When one quotation includes another, the latter has but half the first quotation mark before it, and half the second mark after it.

(5) THE PARENTHESIS encloses matter not actually connected with the sentence.

(6) BRACKETS are chiefly used to enclose corrections.

(7) THE HYPHEN is used to separate the syllables of a word.

(8) A sudden turn in a sentence and the omission of a word, or part of a word, are denoted by a Dash.

(9) A Dash is usually placed before the answer to a question, when they both belong to the same line.

(10) A Dash is often used instead of the parenthesis marks, and commonly used before an expression repeated for special emphasis.

(11) The Apostrophe denotes a contraction by the omission of a letter, and also is used as the sign of possessive case.

(12) The Caret is used to show the omission of letters or words.

(13) The Asterisk, Dagger, and similar marks are used to refer to notes at the foot or side of the page.

The following are marks of reference, and are generally used to call attention to words, sentences, or notes placed at the bottom of the page:

1. The Asterisk, *. 4. And sometimes the Section, §.
2. The Dagger, †. 5. The Parallel, ‖.
3. The Double Dagger, ‡. 6. And the Paragraph, ¶.

Small letters or figures also are used to call attention to notes at the foot of the page.

The Section (§) is generally used for subdividing a chapter into lesser parts.

The Paragraph (¶) denotes the beginning of a new subject, and in manuscript it is often inserted upon a revisal of the matter to denote that a paragraph should commence in a certain place.

The Index (☞) is used where special attention is desired to be called to something of importance.

Helps in Spelling.

No rules fully meet the requirements for satisfactory helps in spelling, as all rules have exceptions. Frequent reference to the dictionary and careful observation of words which occur in daily reading will help to give one confidence. One should always associate the form of the written word with the meaning. The following will be found helpful, and should be carefully studied:

Words of one syllable ending in *l*, with a single vowel before it, have double *l* at the close; as, *pill*, *dell*.

Words of one syllable ending in *l*, with a double vowel before it, have one *l* only at the close; as, *hail*, *rail*.

Monosyllables ending in double *l* when compounded retain but one *l* each; as, *skilful*, *fulfil*.

Words of more than one syllable ending in *l* have but one *l* at the close; as, *delightful*, *faithful*. But if the accent fall on the last syllable, they have a double *l*; as, *befall*, *recall*, etc.

Derivations from words ending in *l* have one *l* only; as, *equality* from *equal*, *dulness* from *dull*; except they end in *er* or *ly*; as, *mill*, *miller*, *full*, *fully*.

Words ending in *e* drop the *e* before the termination *able*; as, *love*, *lovable*; except they end in *ce* or *ge*, when the *e* is retained; as in *change*, *changeable*.

The *i* and *e* often come together in a word, it will be found that in the majority of words *i* and *e* come together after an *l* or a *c*. After an *l*, *i* takes precedence—after a *c*, *e* takes precedence; as, be*lieve*, de*ceive*. When in doubt over an *i* and *e* following a *c* or *l*, remember the word *lice*, which serves as a guide, the *i* following the *l*, the *e* the *c*.

Participles in *ing* from verbs ending in *e*, drop the final *e*; as, *have*, *having*, *love*, *loving*; unless they come from verbs ending in double *e*, and then they retain both; as, *see*, *seeing*, *agree*, *agreeing*. The word *dye*, however, is an exception, and retains *e* before *ing*—*dyeing*.

Adverbs ending in *ly* and nouns in *ment* retain the final *e* of the primitives; as, *brave*, *bravely*; *confine*, *confinement*; except *acknowledgment* and *judgment*.

Monosyllables ending in a consonant, with a single vowel before it, double that consonant in derivatives; as, *sin*, *sinner*.

Monosyllables ending in a consonant, with a double vowel before it, do not double the consonant in derivatives; as, *troop*, *trooper*.

Words of more than one syllable ending in a single consonant, preceded by a single vowel and accented on the final syllable, double that consonant in derivatives; *compel*, *compelled*, *appal*, *appalling*.

Nouns ending in *y* preceded by a vowel form their plural by adding *s*, as *key*, *keys*; if *y* is preceded by a consonant, the plural is formed by changing *y* into *-ies*; as, *fly*. *flies*.

Compound words, whose primitives end in *y*, change *y* into *i*; as, *ugly*, *ugliness*.

How to Write Clearly.

Almost every one can learn to write clearly—that is, so that his meaning may be clear—so far, at least, as clearness depends upon the arrangement of words. Elegance, force and variety of style are far more difficult to acquire; but the observance of a few simple rules will assist much in expressing clearly our ideas. Every one who has occasion to express in writing his thoughts for the entertainment of himself or friends, or to write social or business letters, should at least endeavor to express clearly what he thinks. Of course, this will not take the place of ideas, but will make the ideas of the most practical service.

(1) Use words in their proper meaning.—Refer to the dictionary for doubtful cases.

Do not use *address* for *direct*, *balance* for *remainder*, *beat* for *excel*, *can* for *may*, *couple* for *two*, *dangerous* for *seriously sick*, *drive* for *ride*, *expect* for *suppose* or *believe*, *gent* for *gentleman*, *help* for *avoid*, *mad* for *angry*, *reputation* for *character*, *settle* for *pay*.

(2) Avoid exaggerations—as, '*awfully*, *frightfully*, *stupendous* and similar words where "much" or "very" are meant.

(3) When using the Relative Pronoun, use "who" and "whom" in referring to persons; which," referring to animals, things and young children, and "that" for both animals and things.

(4) Observe that appropriate prepositions must follow certain words.

As this rule is constantly violated, a list of a few common adjectives and verbs is here presented, together with the prepositions properly used in connection with them.

Abhorrence *of*.
Accompanied *with* an inanimate object; *by* anything that has life.
Accuse *of*.
Acquaint *with*.
Adapted *to*.
Agree *with* a person; *to* a proposition from another; *upon* a thing among ourselves.
Analogy *between* (when two objects follow the preposition); *to*, *with* (when one of the substantives precedes the verb).
Arrive *at*, *in*.

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Attended *with* an inanimate object; *by* anything that has life.
Averse *to*, *from*.
Capacity *for*.
Charge *on* a person; *with* a thing.
Compare *with* (in respect of quality); *to* (for the sake of illustration).
Congenial *to*.
Conversant *with* men; *with* or *in* things; *about* and *among* are sometimes used.
Copy *after* a person; *from* a thing.
Correspond *with*.
Die *of* a disease; *by* an instrument or violence.
Disappointed *of* what we fail to obtain; *in* what does not answer our expectations, when obtained.
Entrance *into*.
Expert *in*, *at*.
Followed *by*.
Militate *against*.
Profit *by*.
Reconcile (in friendship) *to*; (to make consistent) *with*.
Reduce (subdue) *under*; (in other cases) *to*.

Between is applicable to two objects only; *among*, to three or more. "A father divided a portion of his property *between* his two sons; the rest he distributed *among* the poor."

In must not be used for *into*, after verbs denoting entrance. "'Come *into* (not *in*) my parlor, said the spider to the fly.'"

In arranging the words of a sentence, observe

(1) Emphatic words must stand in emphatic positions; *i. e.*, for the most part, at the beginning or at the end of the sentence.

(2) Unemphatic words must, as a rule, be kept from the end.

(3) An interrogation sometimes gives emphasis.

(4) The Subject, if unusually emphatic, should often be transferred from the beginning of the sentence.

(5) The Object is sometimes placed before the Verb for emphasis.

(6) Where several words are emphatic, make it clear which is the most emphatic. Emphasis can sometimes be given by adding an epithet, or an intensifying word.

(7) Words should be as near as possible to the words with which they are grammatically connected.

(8) Adverbs should be placed next to the words they are intended to qualify.

(9) When "not only" precedes "but also," see that each is followed by the same part of speech.

THE WEALTH OF COMMERCE

A view of shipping in New York Harbor, with the East River Bridge in the background. The vast output of the productions of the farm, the factory and the mill require great fleets of ships to transport them to other countries. They bring in return the wealth of other lands to our shores. This exchange of goods constitutes the wealth of commerce

(10) "At least," "always," and other adverbial adjuncts, sometimes produce ambiguity.

(11) Nouns should be placed near the nouns that they define.

(12) Pronouns should follow the nouns to which they refer, without the intervention of any other noun.

How to Write Forcibly.

This is a swift age. There is no time for reading long and tedious communications. To command attention, our ideas must be expressed forcibly, and at the first reading must carry conviction. No better example of this can be found than in the advertisements of our large department stores—or in the letters written by heads of great houses in course of their large correspondence—at the same time force should not be sought at the expense of ease and unity of style. We can define a forcible sentence as one which carries conviction—impression when read.

To secure force of expression:

(1) Choose strong, apt, and meaning words.

(2) Use striking figures or illustrations.

(3) Place the most important thing last and secure an impressive arrangement of words.

(4) Omit needless elements, and secure consequent conciseness of expression.

(5) Employ short, rather than long sentences, and select as modifiers single words and phrases, rather than clauses.

Say, "Henry was inclined to be lazy." Rather than "Henry's tendencies were in the direction of indolence."

Say, "Wishing me to become a scholar, my brother sent me to an academy." Rather than, "My brother felt that he would like me to become a scholar, and so he sent me to an academy."

Say, "A physician who was called, announced that the man had smallpox. This, of course, caused a panic in the household." And not,

"It having been decided to call a physician, when he arrived he said that the disease that the man had was smallpox, and this, of course, produced a great deal of excitement among the people in the house."

AN EASY STYLE is secured when the sentences are agreeable to the ear and are easily spoken. Cultivate the habit of framing sentences mentally before writing them; harsh sounding and awkward words and phrases will then be avoided and harmonious expressions will be used in their places.

Avoid the use of high sounding words and phrases and disagreeable repetition of words or sounds. Avoid also the crowding of too many thoughts into one sentence.

The Use of Figures of Speech.

The English is a figurative language, that is, it is a language in which an idea is expressed by the use of words which may suggest something else than the literal meaning. Unconsciously we use these figures and often are unable to define them if asked to do so.

They are the special tools of our language, and as such, should be handled with care. If used skilfully they add strength and beauty, but if awkwardly used they make the user appear affected and makes him a subject of ridicule.

The more common figures of speech are the following:

SIMILE is the comparison of one object to another, and is generally denoted by *like*, *as*, or *so;* as, "He shall be like a *tree* planted by the rivers of water."—"Thy smile is *as* the dawn of the vernal day."

METAPHOR indicates the resemblance of two objects by applying the name, attribute, or act of one directly to the other; as, "He shall be a tree planted by the rivers of water." Metaphor is the commonest of all the figures.

ALLEGORY is the narration of fictitious events, whereby it is sought to convey or illustrate important truths. Thus in Psalm lxxx., the Jewish nation is represented under the symbol of a vine. Bunyan's "Pilgrim's Progress" is an allegory.

METONYMY is the exchange of names between things related. It is founded, not on resemblance, but on the relation of one expression used, to the idea; as "Hear O *Israel*", i. e., *descendants of Israel*—"Our *ships* next opened a fire," i. e., our *sailors*.—"His *steel* gleamed on high", i. e., his *sword*.

SYNECDOCHE is using the name of a part for that of the whole, the name of the whole for that of a part, or a definite number for an indefinite: as, "The sea is covered with *sails*", i. e., *ships*; "Our *hero* was gray, but not from age", i. e., his *hair* was gray; "*Ten thousand* were on his right hand", i. e., *a great number*.

HYPERBOLE is the exaggeration of attributes, or the assigning to a subject of a wonderful and impossible act as the result of ardent emotion; as, "They [Saul and Jonathan] were *swifter than eagles*, they were *stronger than lions*."

Hyperbolical expressions are of frequent occurrence in common conversation; we often say, *as cold as ice*, *as hot as fire*, *as white as snow*, etc., in all of which phrases the quality is exaggerated beyond the bounds of truth. Their frequency is to be attributed to the imagination, which always takes great pleasure in magnifying the objects before it.

IMAGERY is the representation of past events, or imaginary objects and scenes, as actually present to the senses; as "Cæsar *leaves* Gaul, *crosses* the Rubicon, and *enters* Italy", i. e., Cæsar *left* Gaul, *crossed* the Rubicon, etc.

APOSTROPHE is a turning from the regular course of the subject, into an invocation or address; as, "Death is swallowed up in victory. O death, where is thy sting? O grave where is thy victory?"

PERSONIFICATION, or PROSOPOPÆIA, is the attributing of sex, life, or action to an inanimate object; or the ascribing of intelligence and personality to an inferior creature; as, "The Sea *saw it* and *fled*."—"The Worm *aware* of his intent, *harangued* him thus."

INTERROGATION is the asking of questions, not for the purpose of expressing doubt or obtaining information, but in order to assert strongly the reverse of what is asked; as, "Doth God pervert judgment? or doth the Almighty pervert justice?" This figure imparts animation to style. It is constantly employed in the book of Job.

ANTITHESIS is placing of opposites in juxta-position, for the purpose of heightening their effect by contrast, as, "*A good man* obtaineth favor of the Lord; but *a man of wicked devices* will He condemn." This figure is used with great effect in the Book of Proverbs, x–xv. It is one of the most effective ornaments that can be employed in composition.

CLIMAX is the arrangement of a succession of words, clauses, members, or sentences, in such a way that the weakest may stand first, and that each in turn, to the end of the sentence, may rise in importance, and make a deeper impression on the mind than that which preceded it; as, "Who shall separate us from the love of Christ? Shall *tribulation*, or *distress*, or *persecution*, or *famine*, or *nakedness*, or *peril*, or *sword?*"

IRONY is a figure by which is expressed directly the opposite of what it is intended shall be understood; as when Elijah said to the priests of Baal, who were trying to induce their false god to manifest himself miraculously, "Cry aloud, for he is a god," &c. This figure is often considered under the head of ridicule.

ONOMATOPŒIA is the use of a word or phrase formed to imitate the sound of the thing signified; as when we say, *rat tat tat*, to denote a knocking at the door; *bow wow*, to express the barking of a dog; or, *buzz, buzz*, to indicate the noise made by bees.

RAPID BUSINESS WRITING

HOW TO HOLD AND USE THE PEN—THE BEST FORMS FOR ALPHABET—HOW TO ACQUIRE RAPIDITY—STYLES FOR BUSINESS AND SOCIAL USES—BEGINNING AND CLOSING LETTERS—NOTES, CHECKS AND OTHER BUSINESS FORMS

PRACTICAL LESSONS IN USING THE PEN

BY E. C. MILLS, ROCHESTER, NEW YORK,
PRACTICAL PENMAN.

The time has arrived when good penmanship is more of a necessity than an accomplishment. But a few years ago many believed good writers were born, not made. Wherever penmanship has been properly taught the results obtained have been very gratifying, and we feel justified in saying that any one who is not encumbered with some physical or mental deformity can learn to write rapidly and legibly. To say that every one can become an artistic penman would be making a broad statement, but it is no longer doubted that almost any one can learn to write a good business style of penmanship.

In order to accomplish this much time and hard work is necessary for those who have acquired incorrect habits and who have wrong ideas of the meaning of good business writing. It is the aim of the author of this series of lessons to present the subject in such a way that the home learner may acquire, during his spare time, a rapid and legible style of business writing in a comparatively short time.

Before Beginning Practice.

It is often desirable to compare your work at different times with your previous writing, that an accurate estimate may be made of the improvement made. For this reason we would suggest that you write the following in your very best style and preserve for future reference:

Your Place, State, Date.

This is a specimen of my very best penmanship before beginning practice in writing.

(Sign Your Name.)

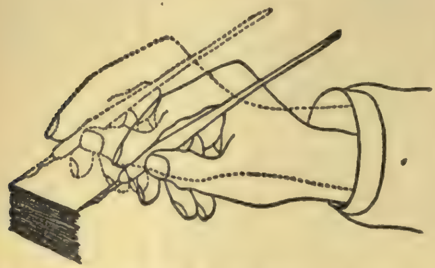
What Materials to Use.

Your progress in penmanship will depend largely upon the materials used. Procure foolscap with a good finish and weight not less than twelve pounds to the ream. Do not try to economize by using poor materials. Ink should be used which flows freely and is black, or nearly so, when first used. Secure a pen that will make a line similar to that of the copies. We would suggest Gillott No. 604 or Esterbrook's A 1 Pen.

Pen-Holding.

The position of the hand and pen in learning to write is of great importance. Study the position of hand and pen in the cut. We do not expect all to assume this position, as no two people hold their pens exactly in the same way. The size and shape of the hand have much to do in regard to this

point. It is a pretty safe rule to say that the holder should not be held sufficiently perpendicular to cross the second joint of the first finger, and should not fall much lower than that given in the illustration.



CUT I. POSITION OF THE HAND AND PEN.

The holder should cross the second finger at the root of the nail, or even just a little higher. The hand should be turned well toward the left, with the third and fourth fingers bent under the hand, resting on their nails. The wrist should not touch the paper.

Position of the Body.

The position of the body, as well as the hand and pen, is of utmost importance and requires the attention of every one who has a desire to improve his writing. A good position cannot be overestimated, and when once acquired is much more healthful and conducive to a free action of the muscles of the arm than an incorrect position. Then let all pay particular attention to the matter of position, especially at the beginning of this series of lessons. Eye yourself closely, as it is not an easy task to rid oneself of habits that have been forming for years, whether they are good or bad.

Take a position at the table nearly square in front, with both arms resting on table, the left with the elbow on the table from two to four inches, the right with the elbow projecting over the edge about two inches. The right arm should rest lightly upon the table and be free to move in any direction, while the body is supported on the left arm. The sides of the paper should be placed parallel to the right forearm. The paper should be held with the left hand *above* line of writing. Do not lean too far forward or bend over your work, as such a position is injurious to health, but if your eyes are not defective keep them from twelve to fourteen inches from the paper. Sit rather close to the table, but do not lean against it. Keep the feet flat on the floor and see that they do not become entangled with the legs of the table or the rounds of the chair. After reading the above instructions several times compare with the illustrations, then assume this position yourself and be ready for work.

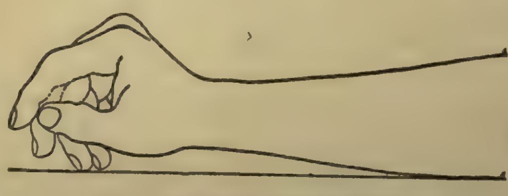
Movement.

Muscular movement is the foundation for all good, practical writing. Whatever may be said about slant or vertical writing, the system of penmanship that is not based upon free movement for its execution will be a failure if rapid business writing is desired. While a certain amount of form-teaching is commendable, still it is the arm-training that will be of service to the young man or woman in acquiring a rapid style of penmanship.

It is supposed that every one who takes up this series of lessons has a knowledge of the formation of all the capitals and small letters, although many write with a slow, laborious finger movement. It will be our aim to change the habit of writing these letters from the slow, labored style to one of ease and rapidity, with a few changes in the form of some letters. First allow the student to obtain a command of the pen, a control over the muscles of the arm, and he will naturally take enough interest in writing to improve in form also.

How to Begin.

You may now take the position of the hand and arm as shown in the illustration "2," without the use of the pen. By holding



CUT 2. POSITION OF HAND AND ARM.

the hand in the correct position before taking the pen an easy movement of the arm may

be secured, as well as the foundation for proper penholding. Rest the hand on the nails of the two last fingers, and make the same motion that will produce the first exercise in Plate II.

Practice rapidly, making not less than 150 pulls toward the body per minute. Next practice sliding the hand from left to right and from right to left across part of the page as shown in Plate I. being sure to maintain the same position throughout. The arm-rest near the elbow should remain in the same place; the arm at the elbow should act as a sort of a hinge. Remember, all of this preliminary practice should be done without pen and ink. This kind of calisthenic practice should be taken until the arm will move readily in any direction. It is better if you take up one thing at a time, and learn to do that in the very best way possible; hence we desire to have you learn to move your arm before using the pen. Do not be in any hurry to take up more advanced work, as your progress will not be satisfactory unless the fundamental exercises have been thoroughly mastered.

How to Proceed.

Penholding will not seem very difficult if you have practiced in the manner suggested, and with the hand held in the same position as illustrated in Cut 2. Do not use ink at first, but practice with a dry pen. Make the oblique exercise as given in Plate II. This is one of the most essential motions used in writing, and a great deal of time should be spent in practicing it. The exercise is made by keeping the sleeve stationary on the table, and forcing the arm to move in and out of the sleeve, using no finger action whatever. Arm down. Study Cut 1, as the dotted lines show the vibration of the arm. Make this exercise fill two large spaces; we call the distance between the two blue lines one large space. Make the oblique exercise just twice that size. After the movement has become established, then you may use ink, but if you find the movement degenerating, commence at the beginning and repeat the same practice as before. Next run the exercise across the page, and try to make it black. This should not be done by pressing heavily on the pen, but by making a series of light lines before moving toward the right.

The Lateral Exercises.

The ability to write a long word without lifting the pen is an accomplishment that will promote rapid writing. To accomplish this the lateral exercises and wide spacing between the letters and words should receive a good share of your time for several months.

Practice on the first lateral exercise given in Plate I. Place the arm about in the center of the exercise, lengthwise, and make the exercise extend about half way across the entire page. Do not allow the hand to turn toward the right, but keep it in the same position as illustrated in Cut 1. Force the hand to slide on the last two finger nails. Make a slight pause at the end of each exercise, and use a steady, swinging motion of the arm. Keep the fleshy part of the forearm down on the table and in about the same place. The tendency at first will be to use the wrist movement; be careful to avoid this, and see that the larger muscles are used.

How to Practice.

Do not practice longer than one hour at a time. The first part of the hour should be devoted to the practice of movement exercises, even after you are capable of making them well. This will insure freedom of motion and smooth lines. This movement practice is excellent as long as the arm is used as the propelling power. If the fingers are used to any extent, the value of the practice is practically lost. If your movement at this time takes in a wide scope, although difficult to govern, your efforts have been directed in the right channel.

Do not be easily satisfied with your work. Criticise your position, your movement, and your writing at all times. Do not omit any of the work. Although some of the exercises may seem distasteful to you, it is just the kind of work that you need, and you should master them if you wish to make the most of your possibilities. Improvement is only promised to those who faithfully follow every detail of the instruction as it is given in each lesson.

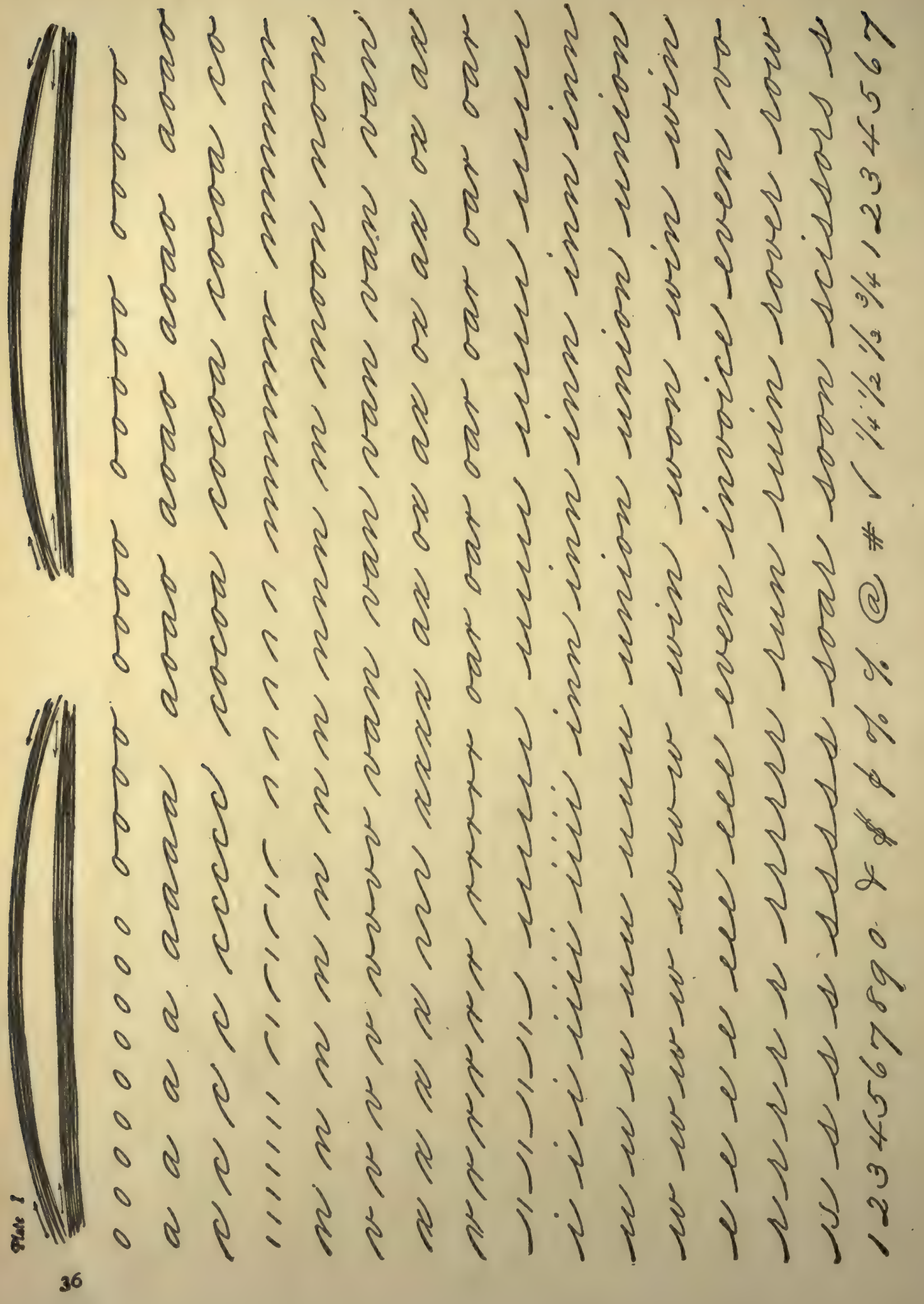


Plate I
union union
win win
invoice even
run rover row
soon scissors
1234567890 & $ ¢ % ℅ @ # √ 1/4 1/2 1/3 3/4 1234567

Plate II.

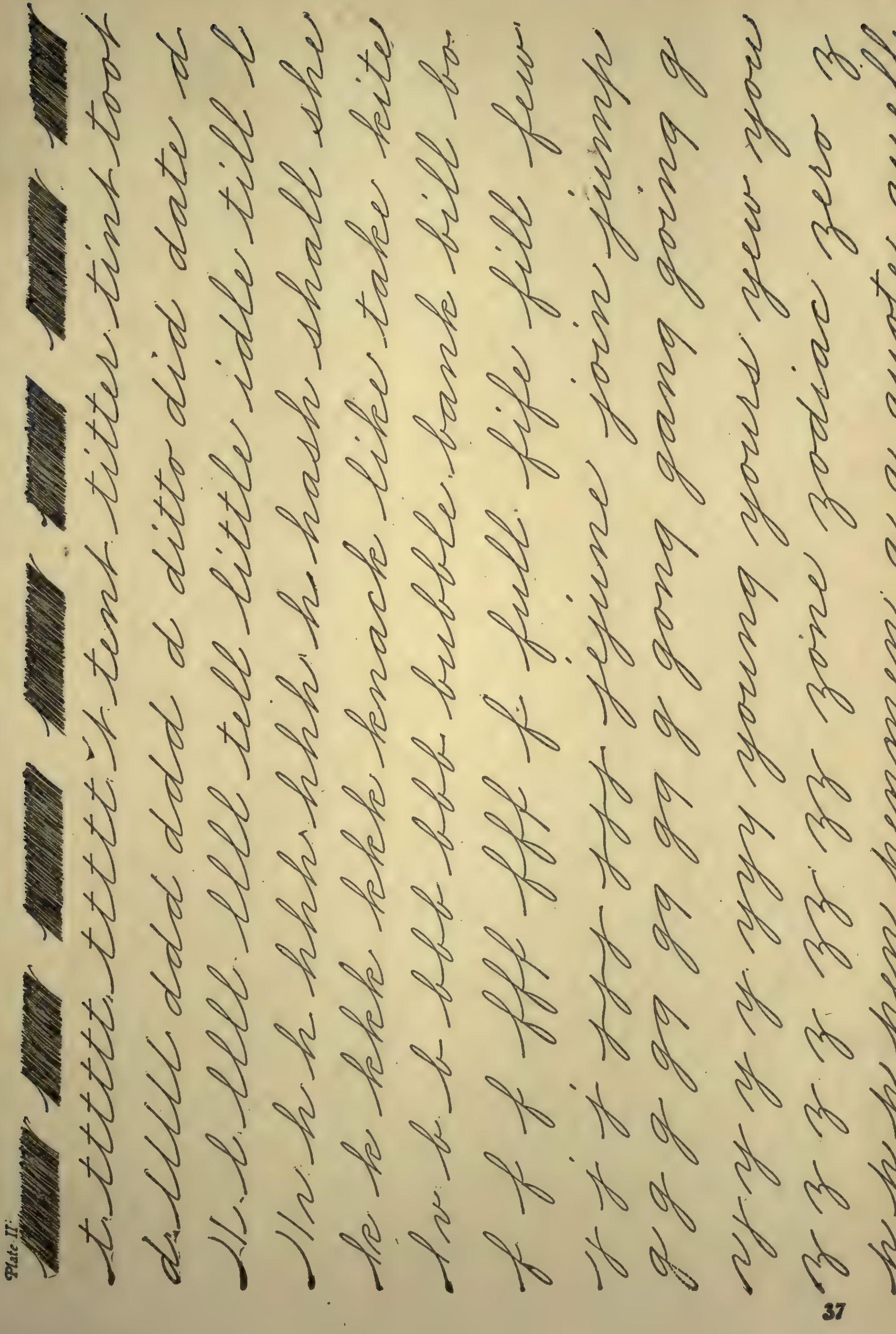
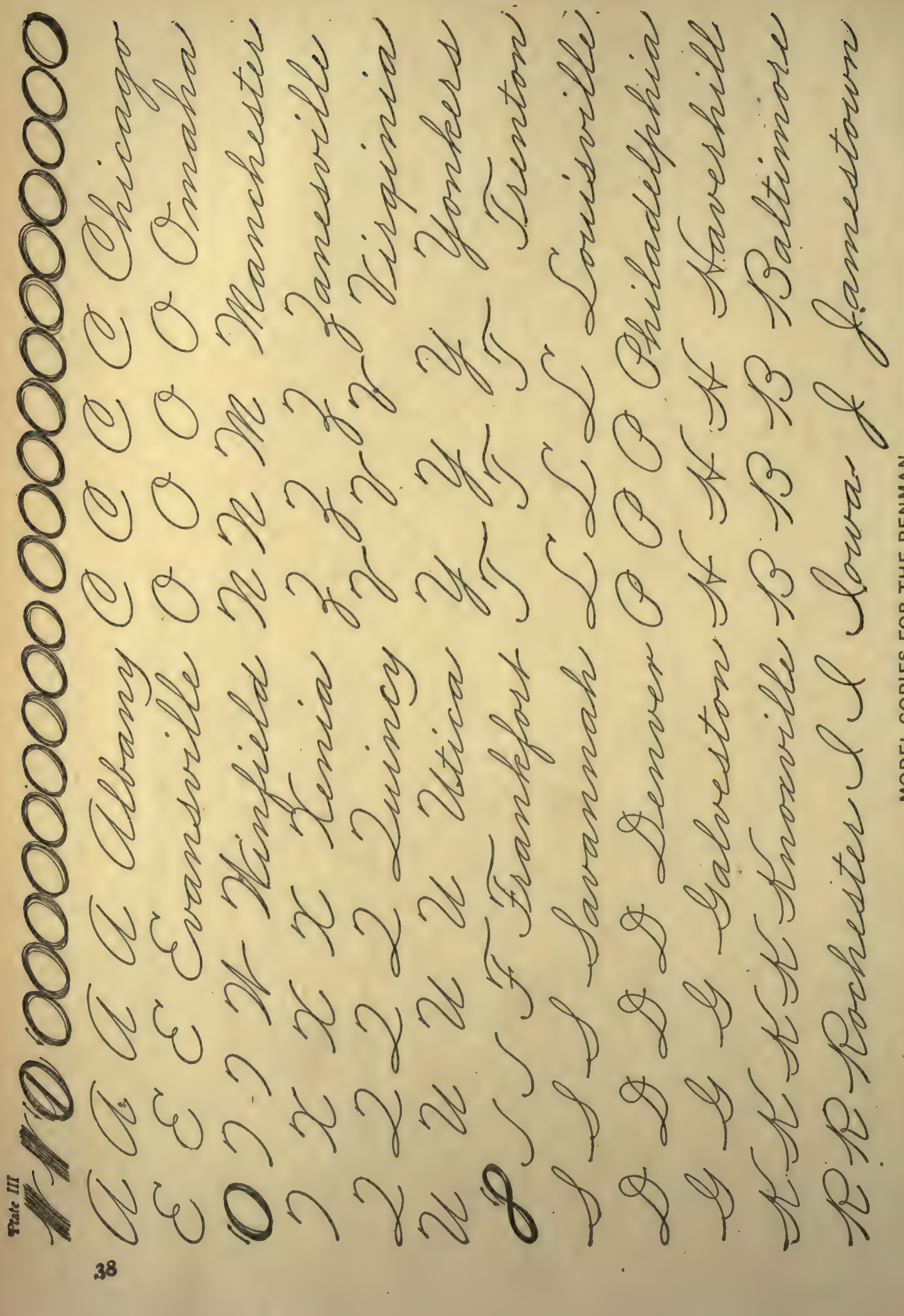

tent titter tint toot
ditto did date
tell little idle till
hash shake shall she
knack like take kite
bubble bank bill
full fife fill few
jejune join jump
gong gang going
young yours yew you
zone zodiac zero
pen pennon quote quell

Plate III



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MODEL COPIES FOR THE PENMAN

This plate and others of the series have been prepared especially for this work by Professor E. C. Mills, the expert penman and acknowledged authority on Penmanship. They give the necessary assistance for acquiring a beautiful style of penmanship. Full and complete instructions will be found in the text.

CORRECT POSITION FOR THE PENMAN

The importance of a good position while writing cannot be overestimated, as it is the foundation upon which we build a substantial business style of writing. Many have learned to write an excellent hand while sitting in a poor position, but they certainly could have accomplished much more and with greater ease during the same time had they learned to sit in a better position. The author has tried to make these illustrations speak for themselves, and those desiring to improve their writing should study each illustration very carefully and follow directions given.

Plate IV

Our recent war with Spain lasted
nearly four months. Havana, Cuba.
Guam is one of our new possessions.
Pan-American Exposition, Buffalo, 1901.
The Peace Conference assembled at
The Hague, Netherlands, May 18, 1899. Czar
Galveston Disaster, September 8, 1900.
Pekin, the capital of China, is near-
ly as large as our own city of Chicago.
Captain Gridley, when you are
ready, fire. Dewey, May 1, 1898. Manila
"The Queen is dead, long live the King!

Plate V

40

Cash. Merchandise. Expense. Stock.
Loss & Gain. Interest & Discount.
Bills Payable. Bills Receivable. Cr.
Inventory. Howells & Farnsworth. Dr.

Dr. Cash 1902.

				Mdse.	Cr.	Sundries	
Jan.	4	16	Mdse. a/c Sales to W. J. Womac	15	82		
"	5	10	To amt. recd. of A. N. Metz, on a/c			96	10

Dr. Langslow & Haines Cr.

190- Nov.	2	To Mdse.	17	74	40	190- Dec.	7	By Cash	18	60	—
"	5	" Sundries	9	86	25	"	9	" Mdse.	20	50	—

Plate VI

Opening a Business Letter.

Philadelphia, Pa., Oct. 4, 1901.

Messrs. Cameron & Co.
Galesburg, Ill.
Gentlemen, Yours of the 1st. inst. re-

Closing a Business Letter.

Hoping to hear from you soon, I remain,
Yours truly,
Isaac T. Johnson.

Opening a Social Letter.

Cedar Rapids, Ia., Nov. 9, 1905.

My dear Friend,
Your letter announcing your marriage to Mr. C.

Closing a Social Letter.

Believe me, my dear friend,
Ever, your loving
Grace.

Plate VII

42

Letter of Application for a Position.

Rochester, N. Y., Jan. 10, 1905.

Manager, 190, World Office.
New York City.

Dear Sir:- I find the above advertisement in to-day's "World." I can meet all the requirements and believe I should enter, with enthusiasm, upon the work offered.

I can give the very best of references as to my character and ability.

Awaiting your reply, I remain,

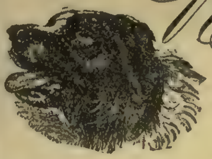
Yours truly,

C. T. Howard.

Plate VIII

Form of Receipt.

$500.00 Winnipeg, Man., Dec. 30 190



Received of Edward C. Mills

Five Hundred $\frac{00}{100}$ DOLLARS

In full to date

No. 46 Wm. Haines.

Form of Company or Firm Note.

$500.00 Halifax, N. S., May 10 190

Thirty days after date we promise to pay to the order of Howard & Brown

Five Hundred $\frac{00}{100}$ Dollars

at City Bank

Value received

No. 410 Due June 9. Clarkson & Avery.

C.E. Morris, Stationer, Rochester, NY

Form of Draft.

$4000.00 Rochester, N.Y. Sept. 17, 190

At sight Pay to the order of John B. Goff

Four Thousand $\frac{00}{100}$ Dollars

Value received, and charge the same to account of

To A. N. Martin,

No. 50 117 Worth St. N.Y. } Gaskell & Jones.

CENTURY BOND

Plate IX

44

Vertical Writing.

A B C D E F G H I J K L M N O P Q R S

T U V W X Y Z

a b c d e f g h i j k l m n o p q r r s t u v w x y z

1 2 3 4 5 6 7 8 9 0 $ ¢ % % # @ √ ¢ ½ ⅓ ¼ ¾ ? ! | 1 2 3 4 5 6 7 8 9 0

"Silver and gold are not the only coin; virtue too passes current all over the world."

"No form of Nature is inferior to Art; for the arts merely imitate natural forms."

Plate X

Mr. and Mrs. Edward Rhoads request the pleasure of Mr. and Mrs. John Davidson's company at dinner, Wednesday evening, at eight o'clock. January eighth, 1903.

STAMP

Mr. John Davidson,
49 Monroe Avenue,
Germantown, Pa.

"Resolved, that the Whittier Literary Society extend its sympathy and condolence to the family of our late member, Thomas Wentworth Higginson."

Instruction for Plate I.

A great deal of time should be spent in practicing the one space letters. The different parts of each letter are illustrated in such a way that any one can see just how each letter is formed. Practice the different principles that are given for the letter, then practice on the letter itself, and after that the combination of letters as shown in the word copies or groups. The figures and commercial abbreviations should be practiced carefully. First, study the form, get a clear conception of the formation of the letter or figure, and then write with a free movement. There is a tendency sometimes with beginners in wanting to slight some of the first work in order that more difficult copies may be taken up. Be careful to work patiently on these small letters, as they are the foundation for good, practical writing. After the principles are practiced, then write a page of each letter, and follow with a page of each word containing that letter. In writing the page of word copies, see that the writing is not spread out too much, or that too wide spacing is left between words. After the proper spacing has been decided upon, see that you write the same number of words throughout the entire page.

Instruction for Plate II.

In this plate we have the loop letters. Loop letters are easily made if the right motion is used in producing them. In the formation of the loop we find the right curve and the straight line. For exercise work we have given the oblique movement exercise. Make this exercise fill one large space in height. Take up the letters and words in exactly the same order in which they are given. Do not omit or hurry over any part of this work.

One of the principal faults in forming the loop is in making the first line too straight. It should be quite a decided curve, then make the downward line practically straight. The two lines should cross about one-third the height of the loop, and be careful not to make them too long. Perhaps a little finger action would help you in making these, but let the main motion come from the arm.

Unless you can write all the one space letters as found in Plate I with the muscular movement, you will have a very poor foundation upon which to build loop letters. In your loop letters some space should be left between the top of the loop and the blue line above. If any letter or word seems very difficult, that is the one you should practice on most.

Instruction for Plate III.

In Plate III all the capital letters are presented, and they should be practiced in the order in which they are given. First practice on the movement exercises and then gradually take up one letter at a time. At least one page should be filled with each word copy. The work grows more difficult as we advance, therefore will be seen the necessity for the thorough working of the preliminary exercises before trying to make these capital letters. Do not sacrifice the movement for form; for, while you may gain some in form, you will lose in movement, without which your writing is poor indeed. After having practiced all of the work given in this plate, it is a good plan to return to some of the letters and review them. Select several of the most difficult capitals and aim to make the greatest improvement possible in those letters. Compare your work with the copy often and see that precisely the same forms of letters are used that are given in the copies. It is better to have but one style of capital letter and practice that so thoroughly that the work becomes almost automatic. You will scatter your forces too much if you try a number of optional forms in capital letters. In giving these letters for practice we have selected the very plainest forms and those that are used most frequently by business men and good business writers everywhere.

As soon as one letter is learned you should make a practical application of that form in all of your everyday writing.

Instruction for Plate IV.

There are many who can make a word or a line appear to advantage, but when it comes to a page of miscellaneous work, there is something lacking. The remedy for this is the practice of miscellaneous page

work, and we hope our home students will write the work given in Plate IV over many times. There are no new capitals in this, and it will serve as an excellent copy for this class of work. Study the arrangement of your work and be sure to write with the free-arm movement. Avoid every tendency to shade or flourish, and endeavor to cultivate neatness and order in all your practice work. We believe the copies presented contain educational value aside from the practice of penmanship, and we can make our practice doubly valuable by taking up only such copies as contain important statements.

Instruction for Plate V.

The copies in this plate are such as will help those who have occasion to do work in bookkeeping. The first four lines of copies are intended to furnish material for the practice of ledger headings. The writing is made somewhat larger than that used for ordinary correspondence work, as the main thing in ledger headings is to have the work plain and legible in the extreme. Some accountants prefer to shade their ledger headings, and several examples of this kind of shaded writings are given on this plate which will show how this work is done. It requires more skill to do shading and have the work look well, and this should only be attempted by those who are quite proficient in using the pen. The writing used for explanations in bookkeeping entries should always be quite small and should never be shaded nor flourished.

Instructions for Plates VI. and VII.

In letter-writing great care should be taken that the style of writing be perfectly plain. Too much care cannot be taken in writing signatures, as often very good penmen will write their name in such a way that it is difficult to read them. Many presume that their signature is so familiar to the general public that they finish the otherwise well-written letter carelessly in that respect. Do not sign your name with flourishes, but endeavor to use the plain forms that have been given throughout the series of lessons. These forms, in Plates VI and VII, offer excellent models for practice in letter-writing, and be sure that you follow the arrangement in every respect. After practicing on these models you may make a little variation in the subject-matter and sign your own name, and in that way you will get practice that will be very beneficial to you when it comes to actual letter-writing. The only way to make a success of your handwriting is to use good writing in your everyday work.

Instruction for Plate VIII.

These forms will give you an idea how to apply good penmanship in connection with business forms. If you have blank forms similar to the ones presented herewith, you may fill them out in order to get the proper size of writing and correct arrangement of the work. Follow these copies in every particular, as they are based upon up-to-date models of business forms.

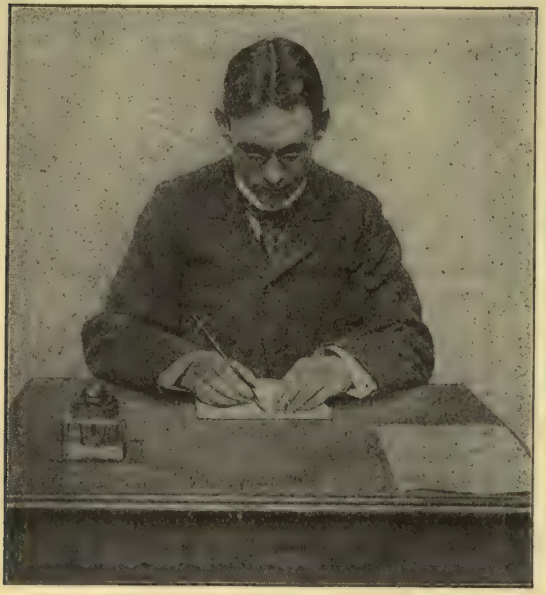
Instruction for Plates IX.–X.—Vertical Writing.

As vertical writing has been very popular in different sections of the country during the past few years, it has been thought advisable to give also instruction and practice in this style of writing.

Position for Vertical Writing.

The position for vertical writing differs somewhat from the position advised for slant writing. Notice the square front position and also that about half or three-fourths of both forearms are on the desk and that the elbows are kept quite close to the body. The paper should be held directly straight in front of the body in order that the lower edge of the paper may be held parallel to the edge of the desk. The penholder should point in the direction of the elbow, and, as will be noticed, the hand is turned more to the right than in the slant writing. The wrist should neither be flat nor turned to the right until the side of the hand touches the paper, but about half way between these two positions. Do not try to slide the hand on the tips of nails of third and fourth fingers, as this forces the hand in an upright position which makes it impossible for the student to see his own writing.

Many try to write the vertical without any change in penholding, movement, or position of the paper. Experience has shown that the results will not be satisfactory unless the change is made, so we urge that all should conform as near as possible to the position illustrated herewith.



POSITION FOR VERTICAL WRITING.

How to Produce Vertical Writing.

To produce the straight downward stroke in vertical writing, draw the pen toward the body, rolling the forearm on the muscles. To make the broad turns between the letters, roll or pull the arm back into the sleeve and to the right at the same time. As the arm should rest lightly on the desk, it may slide very much the same as the third and fourth fingers do. This, of course, cannot be done if the weight of the body is thrown forward on the arms.

Speed in Writing.

After the student has a good knowledge of form and can write all the letters with a reasonable degree of speed, it has been found advisable to practice on copies for speed work alone. Take a sentence-copy and let the student time his writing by the watch. Each time the sentence is written he should endeavor to increase in speed a little and at the same time get good form to the letters.

Patience and Perseverance in Writing.

The home student in learning to write should develop patience, and in order to secure an acceptable business hand must learn perseverance. These are two very essential qualities for success in writing. Many pupils in starting their practice on this series of lessons will perhaps write a few words of one copy and then a few words of another; perhaps they will practice a little on the movement exercises and then think that it is about time that some substantial improvement should show itself. The first few weeks of practice may tend to discourage the pupil as many write with a slow, cramped finger movement, and when the change is made to the free movement considerable is lost in form. Many give up in despair when they see that their writing is not improving perceptibly in form from the start. There will be an improvement, however, in the freedom of movement, if the instructions are faithfully followed; this is absolutely essential in learning to write a good business hand. That is the time to be encouraged, as the manner of writing is being changed, and it is right here at this critical time that the pupil must learn patience and must be persevering in his work. A few fitful hours of practice will benefit the writing but very little, in fact, it is worse than no practice at all. A definite plan should be followed as nearly as possible, and adhered to very closely if the student expects to improve the condition of his writing. From thirty to forty-five minutes a day should be spent in the practice of writing until a good business hand has been attained.

The student should remember that a good handwriting is worth hundreds of dollars to its possessor, and that nothing valuable in education was ever achieved without hard labor and many disappointments. Be patient, be persevering, work hard, and a good style of writing will be the result.

MONEY AND BUSINESS

THE COMMON MEDIUM OF EXCHANGE—MANY KINDS OF MONEY—MONEY OF ALL COUNTRIES—DIFFERENCES IN VALUES—BANKS AND BANK FORMS—HOW MONEY IS TRANSFERRED—RULES GOVERNING BUSINESS TRANSACTIONS —FORMS USED IN BUSINESS

WHAT IS MONEY

Francis A. Walker, a distinguished authority, defines money as "that which passes freely from hand to hand throughout the community in final discharge of debts and full payment for commodities, being accepted equally without reference to the character or credit of the person who offers it and without the intention of the person who receives it to consume it or enjoy it or apply it to any other use than in turn to tender it to others in discharge of debts or payment for commodities." *Currency* is the name given to the legal medium of exchange in every country.

Various articles have passed current as money in various communities at different times. *Tobacco* was used as money by the early Virginia settlers; the skins of fur-bearing animals served the same purpose in some parts of this country at a much later date. For ages gold and silver have been the first choice of all nations as the standards of value. Some one has truly said, "Abraham, 1900 years before Christ, weighed out uncoined silver in payment for land, and 1900 years after Christ gold-dust passed current as money among the 'forty-niners' in California." The standard of monetary value of the civilized nations of the world is a fixed amount of gold or of silver, which, taken together, is called bullion.

Gold and Silver Money.

In the United States the *dollar* is the unit of value, and is equal to 23.22 grains of pure gold. Therefore, when we say that an article is worth so many dollars we mean it is worth so many times as much as 23.22 grains of pure gold.

The gold coins of the United States actually contain the gold in the proportion of 900 parts gold and 100 parts alloy, and are the only form of money actually worth its face value as a commodity; therefore gold is the only money that will be accepted in a foreign country at par. The gold coins of the United States are the 20-dollar piece or double eagle, the 10-dollar piece or eagle, the 5-dollar piece or half eagle, the 3-dollar piece, the 2½-dollar piece or quarter eagle, and the gold dollar, which has not been coined since 1890 and which is now not much in circulation but considered rare.

An estimate has been made showing there is about $7,000,000,000 in gold in use in the world, and this, if put into one place, would fill a room 64 feet long, 50 feet wide,

and 20 feet high. In the banks and treasuries gold coin are piled in bags each containing $5000 and weighing 22 pounds.

The silver dollar weighs 412½ grains, of which 371¼ grains is pure silver and 41.25 grains alloy. This amount of pure silver was at one time equal in value with 23.22 grains of pure gold. Of late years it has been much cheaper, and its relative value to gold is no longer 16 to 1, being determined by commercial conditions.

The half dollar, quarter dollar and dime, as well as the 5-cent nickel and the copper cent, contain still smaller proportions of silver, and are intended only for circulation in this country as representatives of the fractional parts of a dollar. They are legal tender for debts not exceeding five dollars in amount.

The standard of value are the gold coins, which stand upon their own merits as actually worth what they represent on their face. All other coins only *represent* their face value, being accepted throughout the land because they are by law exchangeable for the amounts for which they stand.

Paper Money

There is another medium of exchange not having any value in itself, but representing the credit of the government. It is, in fact, a form of "promise to pay," and for that reason it is often called "fiat money" or "paper money." Paper money is largely in use in this country, and is represented by four different kinds. The first and second are called respectively *Gold Certificates* and *Silver Certificates*. These are issued by the Treasury, and represent on their face the number of gold or silver dollars held in the Treasury of the United States payable on demand to bearer. These certificates are popular on account of their convenience, and are always worth par. The third kind is the *Treasury note* or *greenback*, which is a promise to pay the bearer on demand (therefore a demand note) without interest. There are now in circulation $300,000,000 of Treasury notes. This was called into existence during the Civil War, and for a time was not worth par in gold. Now it is worth par, as the credit of the government insures their payment.

50

The fourth class is the *National Bank note*, issued by banks holding a charter from the United States, and whose circulation is secured by United States bonds deposited with the Treasurer of the United States. The payment of these notes is guaranteed by the United States Government.

Gold certificates are issued in denominations of $20 and upwards.

The Silver certificates in $1, $2, $5 and upwards, to $10,000.

The Treasury notes in $1, $2, etc., to $10,000.

The National Bank notes are issued in denominations of $5 and upwards.

Money of the British Empire.

Great Britain in actual circulation has the gold sovereign (value $4.8665) and half-sovereign; the silver crown (value $1.087), half-crown, shilling (value $0.217), six-pence, four-pence, and three-pence. It has a paper currency, which includes the notes of the Bank of England, the smallest denomination of which is five pounds; the notes of the Scotch and Irish banks, the smallest denomination of which is one pound. Certain joint stock and private banks also issue notes.

Canada has a currency similar in form to that of the United States. But she has no gold coinage of her own. She uses the gold coinage of the United States and Great Britain, and they are legal tender. The silver coins are similar to those of the United States except that there are no silver dollars and no silver five-cent pieces. There are notes issued under the laws of the Dominion of the denominations of $1, $2, and $4, and are redeemable in gold on demand. The chartered banks issue bank notes in denominations not smaller than $5. Unlike the laws in the United States, no special security in the way of deposit of bonds is required, but the notes, in case of the bank's insolvency, become a preferred claim against all assets of the bank, and include the double liability of the stockholders. The total issue rarely exceeds sixty per cent. of the paid-up capital of the bank, and in no case must it exceed one hundred per cent.

AUSTRALIA has the same monetary system as that of Great Britain.

BRITISH INDIA has a silver standard unit, which is the rupee, whose value is $0.444. It has gold coin of five, ten, fifteen, and twenty rupees, respectively. The government notes, ranging in value from five to ten thousand rupees, are issued and secured by deposits of gold and silver. The money in circulation in India is said to exceed one billion dollars.

Money in Foreign Lands.

GERMANY has a gold standard, and the mark, whose value is $0.208, is the unit of value. The 5-mark piece is the smallest gold coin. The 5-mark, 2-mark, 1-mark, ½-mark, and ⅕-mark pieces are the silver coins. Germany has a paper money which includes the imperial treasury notes, and the bank notes of the Reichsbank, a corporation owned by individual shareholders, but controlled by the government. The issue of notes of less than 100 marks in value is prohibited.

AUSTRIA-HUNGARY has recently established a monetary system making as the unit the gold crown, whose value is $0.203. The 10-crown and 20-crown pieces are in gold, and the crown and a half-crown pieces are in silver. However, there is very little metallic money in circulation. There is a paper currency issued by the Austro-Hungarian Bank in denominations of 10, 100, and 1,000 florins, and by the treasury in smaller denominations—this money is irredeemable. The value of the florin is two crowns, or about forty cents.

THE LATIN UNION, including France, Belgium, Italy, Switzerland, and Greece, has now a single gold standard, of which the franc, whose value is $0.1929, or nearly twenty cents, is the unit of value. The smallest gold coin is a 5-franc piece, equivalent to a dollar; in silver are the franc, the 2-franc, the half-franc, and the 20-centimes. The latter is one-fifth of a franc, or four cents. The coins of one country of the Union are received at par in all the others. France and Belgium have state banks which issue bank notes. In Belgium, individuals and associations are also free to issue bank notes on their own responsibility. Italy has no state bank, but there are in the country six banks which are authorized to issue notes payable on demand. The smallest denomination is 50-lire, in value, about 19 or 20 cents. Switzerland uses the coin of the Latin Union, and also has a state bank. Its central office is at Berne, and there are branches throughout the country.

IN GREECE there are three banks authorized to issue notes. But gold and silver reserves are so small that for many years gold has been at a premium.

IN SPAIN the silver peseta, equivalent to the franc, or twenty cents in our money, is the monetary unit. The gold and silver coins are the same in Spain as the other countries of the Latin Union. The Bank of Spain is the only bank of issue in the country. It is a private institution, with certain government restrictions. The smallest note of issue has the value of 25-pesetas, in our money equal to nearly five dollars.

IN MEXICO there is a silver standard. The unit is the Mexican dollar, called el peso; and, under the name of piaster, it circulates in several countries in Central and South America, Asia, and Africa. Mexico has also a few gold coins in circulation, the smallest is equivalent to our gold dollar in value.

Banks and Banking.

Banks, both national and private, offer another means of exchange. Any one having money deposited in a bank to his credit may give to a third party an order on the bank for any number of dollars and cents not exceeding the full amount of his credit. These orders on the banks are called *Bank Checks*. They differ from paper money, as their acceptance depends upon the credit of the one who draws (or signs) the check. It is usually made payable "to the order of" some one. The party presenting the check must be known in some way to the bank authorities.

The use of checks adds to the circulating medium, and is a benefit to the community at large. It leaves actual money for minor transactions. They are in far more extensive use than any other form of money order. Checks often pass from

hand to hand as money before they reach the bank, and then are seldom cashed—usually deposited. Over a hundred million dollars of checks daily in New York alone are not cashed at the paying teller's window, but pass in "exchanges" through the Clearing House, which is an association of the banks of a large city for the purpose of conveniently and quickly transferring checks they hold for collection. This saves an immense amount of time and labor, which would otherwise be spent in handling and counting the money, and also lessens the chances for mistakes.

Utility of Bank Accounts.

This leads us to consider the advantages of keeping an account at bank.

(1) There is the safe keeping of the money, and protection from loss by burglary. (2) It is an easy way of collecting. If the business man were obliged to send his messengers to various parts of the city or neighboring towns to collect the cash for the various checks, drafts and money orders he received, a great deal of his time would be taken. When he deposits the checks and drafts the bank does the collecting for him. The bank also collects for him such drafts as he may draw upon his debtors in distant places, charging only a small fee for the service, and sometimes without charge.

(3) It offers facilities for making payments and for saving of time in handling and counting out large amounts in bills and coin, and lessens the risk of loss by mistakes.

The merchant who keeps an account at a bank, establishes an acquaintance with the institution, and is able to borrow money by borrowing upon his notes when needed. The lending of money by discounting notes, etc., is a prominent part of the business of a bank, yet there are times when the bank will discount only for its own depositors with whose character and responsibility it is well acquainted.

How to Open an Account at Bank.

A bank will not open an account with any one who may desire it. The depositor is expected to obtain an introduction to the officers of the bank by some one who is well known to them, and to satisfy them that he is a person of proper character and responsibility. In the interview with the cashier he will be asked questions which may be answered in confidence, to satisfy the cashier of his business habits. The depositor then writes his name (just as he will sign his checks) in the "Signature Book," so that the bank may guard against forgery. The depositor then makes his first deposit, and the receiving teller gives him a pass book, with the amount entered therein.

DEPOSITED AT THE

Hanover National Bank

February 15, *1901.*

By *John S. Vansandt*

	DOLLARS	CENTS
BANK NOTES, ...	*125*	
" " 1's and 2's .	*13*	
SILVER, ...	*15*	*50*
GOLD, ...	*20*	
CHECKS, ... In New York, name the Bank; out of Town, name the Place. *Please Enter Separately.*		
Chemical National	*43*	*75*
First National	*18*	*25*
Pittsburg, Pa.	*115*	*21*
Columbus, O.	*75*	*19*
Toledo, O.	*84*	
Total, . .	*509*	*90*

THE DEPOSIT SLIP.—Whenever a deposit is made the depositor fills out a deposit slip, furnished by the bank, to be retained by the receiving teller and by him given to the bookkeeper. The above is one form of a Deposit Slip.

CHECKS.—A *Check* is a written demand, which is addressed to a bank by a person who has money deposited therein for the payment of a part or the whole of his money to a third party.

The Heading, the Order to pay, the Amount Repeated in figures, the Signature, and the Number of the check are the parts of a check.

The *Heading* of the check is in all respects the same as that of a letter, and includes address and date.

The *Order* is written beneath the heading and fills the line for the full length of the check, and usually occupies three lines. The name of the bank, printed in bold type, is on the first line; on the second are the printed words *Pay to*, which are followed by the name of the person to whom the payment is to be made, or the *payee*. On the third is written the amount to be paid, the number of dollars to be paid being indicated in script, and the number of cents, in figures as a fraction of a dollar. It is optional whether the word *and* be used between the dollars and the cents. The line generally ends with the printed word *Dollars*.

Begin with capitals the words *Pay* and *Dollars*, and all important words in the name of the bank, as well as all words expressing numbers, except such as may be connected with preceding words by the hyphen.

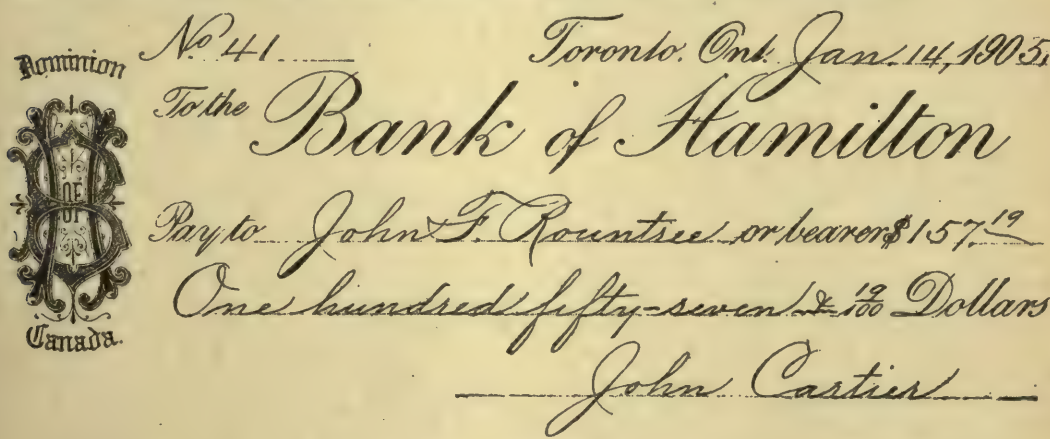
The *Amount Repeated* is in figures, the same in amount as mentioned in the order. But it is sometimes written in the body of the order with the script statement and sometimes in the upper left-hand corner of the check on a line with the heading. It is placed in the lower left-hand corner on a line with the signature.

The cents are expressed fractionally, as in the body of the order.

Most business men number their checks in the order they are issued. The number is found in one of the corners which is not occupied by the value of the check written in figures.

How to Draw a Check.

Checks are principally of two kinds: Negotiable and Non-negotiable.



CORRECT FORM FOR CHECK

A *Negotiable Check* is one that may be transferred from one person to another, and a *Non-negotiable Check* is one that cannot be so transferred.

In drawing a negotiable check the order may be in one of the following forms: Pay to Bearer; Pay to the order of So-and-so; Pay to So-and-so or order. The first makes the money payable to any one that may present the check. The second or third makes the money payable to any person to whom the payee may order it paid.

When the word *Bearer* is used, the check is negotiable as it stands; but when the word *order* is used, the payee can neither collect the money himself nor transfer the check to another without writing his name

upon the back. This is called indorsing the check. When the payee writes his name only, he is said to indorse the check in blank. By this indorsement he makes the money payable to bearer, and the check is still negotiable. When the payee wishes the money paid to a particular person only, he writes on the back *Pay to So-and-so*, and signs his name beneath. With such an indorsement the check is no longer negotiable. But when the payee wishes to transfer the check to another, so that it can be transferred to still another, he writes on the back *Pay to the order of So-and-so*, or, *Pay to So-and-so or order*, and signs his own name beneath this. The check is now also negotiable. This may be repeated by the second person and so on, by indorsing it under the other indorsements. The *Holder* is the person who is in legal possession of a check.

How to Indorse Checks.

For indorsement, first turn the check so as to bring the left end to the top, and then turn it face downwards and write the indorsement near the top. Each successive indorsement should be written under its predecessor.

Checks are usually bound in books. At the left of each check so bound, and on the same piece of paper, is a ruled form for a complete description of the check. Between the check and this ruled form there is a line of perforations by means of which the check can be torn off for use. The paper that remains behind is called the *stub*.

Before depositing the checks they must first be indorsed. The customary form of indorsement is to write or stamp across the back of the check and about one inch from the top:

FOR DEPOSIT TO CREDIT OF
Herbert Smith
OR
FOR DEPOSIT ONLY
IN HANOVER NATIONAL BANK
FOR CREDIT OF
Herbert Smith

The *left* end of the face of the check is the *top* of the back. Any person named for the purpose may sign an indorsement for deposit. Checks thus indorsed can only be deposited, and should they be lost on the way to the bank the finder cannot use them, because as stated the checks are to be deposited, and the bank is not authorized to pay them to any one.

No. *974*			No. *974* *Wilmington, Del.,* *Feb. 15, 1901*
Feb. 15, 1901			**FIRST NATIONAL BANK OF WILMINGTON**
To P. S. James			*Pay to the order of* *Peter S. James* *94\frac{25}{100}$*
Rent for Feb., 1901			*Ninety-four $\frac{25}{100}$* *Dollars.*
	94	*25*	*William G. Pollock*

The Check Stub and Check showing how record is kept in check book

If the holder receives a check in which his name is incorrectly written, he must first indorse the name as it is written and under that write his own name correctly. When the deposit slip has been made out, it is well to keep a copy upon the reverse side of the stub of the check book. The checks, money, deposit slip and pass book are then taken to the receiving teller, who examines the deposit slip to see that it is correct and enters the amount in the pass book. This entry is his receipt for the amount deposited.

It is of the highest importance that the depositor keep his check book correctly and punctually written up. It is his guide to his bank account and he should be able to tell at once exactly how much money he has in bank at any given time.

When to Balance Pass Books.

At short intervals, the pass book should be left at the bank for settlement. The bookkeeper will enter, on the page opposite the deposits, the amounts of the checks that have been paid by the bank, and bring down the balance to depositor's credit in the bank at that time. When the pass book is returned compare the stubs in the check book and bank book at the date of settlement. If the bank book and check book do not agree, check off the deposits entered in the bank book with those in the check book; if the difference is not found, try the additions and subtractions in the check book. The bank book may show a larger balance than the check book on a certain date. This may show that some check or checks given out by you, and subtracted in the check book, have not yet been presented at bank for payment. To find the bank's balance add the amount of the check or checks to the check book balance. If this prove correct let the check book balance remain as it is, for that is really the amount there is in bank to be checked against.

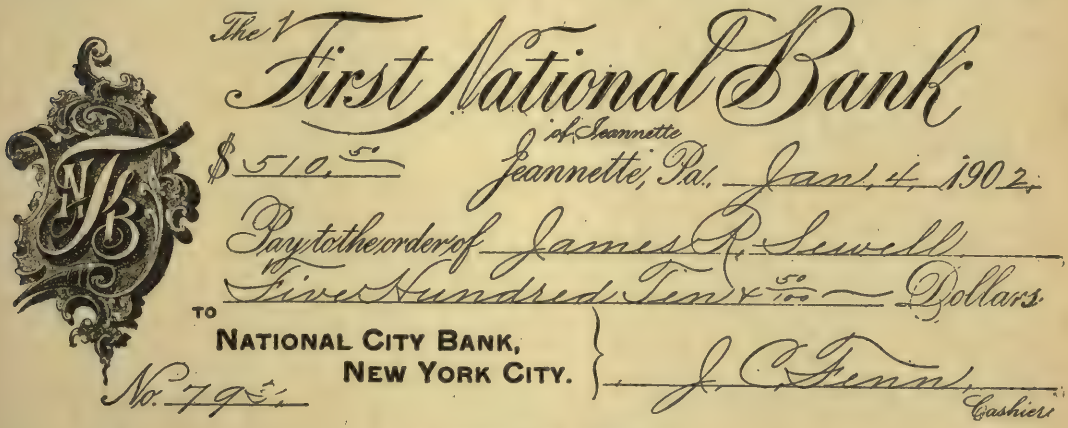
Checks are Good Receipts.

It is evident that money is placed in a bank for safe-keeping, and that the bank becomes responsible for it. Therefore no part of it will be paid out without a check or written order of the depositor. When these checks are returned to the depositor and his pass book balanced, the bank is released from responsibility to that amount.

It is evident also that a check given in payment for goods or for any obligation becomes a receipt to the one who drew it; for the person in whose favor it was drawn by writing his name on the back of the check acknowledges the receipt of the money. Some persons state on the face of the check "in payment for"; but this is not good form, nor does it stand in law for more than the plain check. The checks cancelled at the bank stand as the bank's receipts or vouchers for depositor's money when returned to him or to his order.

If the drawer fails to take ordinary precautions to protect his checks from being "raised" or changed, the loss falls upon him should the bank pay the check for wrong amount.

Write your signature without flourishes and as nearly as possible like the specimen left at the bank when you opened your account. It is always desirable to write your first name rather than initial.



A CASHIER'S CHECK

How Checks are Certified.

In many transactions, involving the transfer of a large amount of valuable property for cash, an ordinary check is not satisfactory to the person who is parting with his property, for he is not sure that his check will be honored when presented, however good the standing of

the drawer may be. Therefore the check may be presented to the paying teller or cashier of the bank on which the check has been drawn, who, after finding that the amount is still to drawer's credit, writes or stamps across its face the words, "Good when properly indorsed," or "certified," and signs his name. The amount of the check is at once charged to drawer's account, and is the same as cash withdrawn. The certification of checks is largely practiced in large business centres, as in Wall Street, New York, where the daily sales of stocks and bonds run up into the millions, and failures caused by fluctuation in prices often come with startling rapidity. A check which may be good to-day, to-morrow may be worthless.

When a check has been lost, in the mails or otherwise, stolen, or given in mistake, the payment of the same may be stopped by the drawer at any time before it is presented at bank. Parties holding such a check honestly, and for value given, may have recourse to law for collection of same.

Drafts and Bills of Exchange.

A draft, or bill of exchange, is, in fact, a letter written by one person to another living in a different place, requesting him to pay a sum of money to the order of the drawer or to a third person. Commercial usage recognizes particular forms for writing these drafts.

There are two kinds of bills of exchange, Domestic and Foreign.

Domestic Bills of Exchange are payable in the same country in which they are drawn, and are commonly called *Drafts*.

Foreign Bills of Exchange are payable in another country from that in which they are drawn, and are called *Foreign Drafts*.

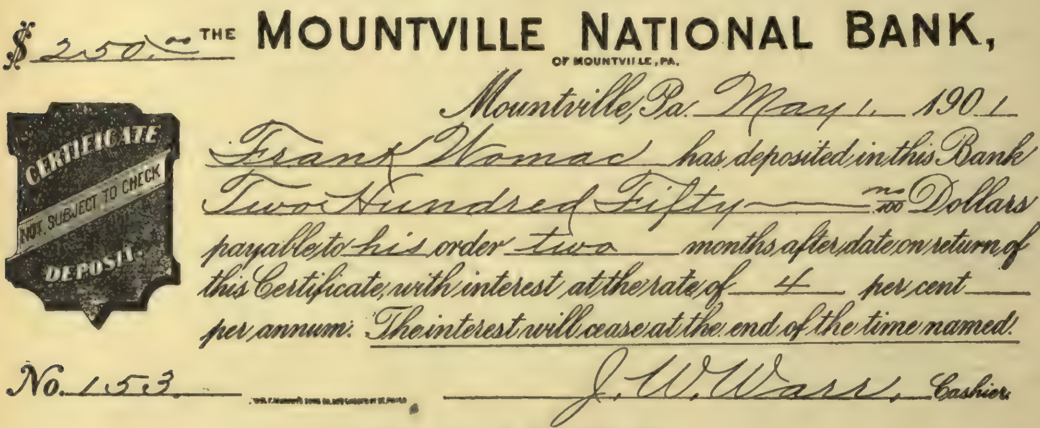
The parts of a bill of exchange are the *Heading*, the *Order*, the *Repeated Amount*, the *Signature*, and the *Address*.

The first four of these parts correspond, respectively, in position, arrangement, capitalization, and punctuation to the heading, the promise, the repeated amount, and the signature of a check or promissory note.

The *Address*, preceded by the word *To*, is begun either on the same line as the signature, or on the next line, but as far to the left as possible. It usually includes both name and location, each of which occupies a line by itself.

The person who signs a bill of exchange (or draft) is called the *Drawer* or *Maker;* the one to whom it is addressed, the *Drawee;* the one to whom it is made payable, the *Payee;* and the person who is in legal possession of it, the *Holder*.

Bills of exchange, like notes and checks, are either *negotiable* or *non-negotiable*, according as they are payable to the order of a person or simply to the person himself. The former are the more common.


$250.00 THE MOUNTVILLE NATIONAL BANK,
OF MOUNTVILLE, PA.
Mountville, Pa. May 1 1901
CERTIFICATE NOT SUBJECT TO CHECK DEPOSIT.
Frank Womac has deposited in this Bank
Two Hundred Fifty —— 00/100 Dollars
payable to his order two months after date on return of
this Certificate, with interest at the rate of 4 per cent
per annum: The interest will cease at the end of the time named.
No. 153 J. W. Wass, Cashier.

CERTIFICATE OF DEPOSIT

A *Sight Draft* is one payable at sight; that is, on presentation.

> *257\frac{00}{100}$. Savannah, Ga., March 29, 1901.*
> *At sight, pay to the order of Booker Washington, Two Hundred Fifty-seven Dollars, value received, and charge to our account.*
> *George P. Richards & Co.*
> *To Theodore P. Thomas & Co.,*
> *New York City.*

A *Time Draft* is one made payable a certain specified length of time after sight or after date.

> *469\frac{00}{100}$. Mobile, Ala., March 1, 1901.*
> *Thirty days after date, pay to the order of Sylvester Cutler, Four Hundred Sixty-nine Dollars, and charge to the account of*
> *John G. Cannon.*
> *To J. B. Smith & Co.,*
> *Phila., Pa.*

Foreign bills of exchange are usually made in sets of three, which are alike in all respects except their designations of *first*, *second*, and *third*. The three bills are usually sent by different mails, and whichever arrives first is used. The others are then worthless. These bills differ from ordinary drafts, by the insertion in each, of the condition that it is to be paid if the other two of the set are unpaid.

Drafts are sent through banks, and not through the mails, and are used to avoid the risk, inconvenience, and expense of sending actual money from one place to another. The principal object for which it is used is to collect money due from the drawee to the drawer. For instance, if Jones, of Chicago, owes Smith, of Philadelphia, $750, Smith may draw on Jones for that amount. He will deposit the draft properly drawn with his own bank in Philadelphia, which will forward it to

> *Exchange for £800.*
> *New York, Sept. 3, 1900.*
> *Ten days after sight of this First of Exchange (second and third unpaid), pay to the order of E. N. Towne, Eight Hundred Pounds sterling, value received, and charge to account of*
> *James H. Moody & Co.*
> *To Drexel, Morgan & Co.,*
> *London, England.*

the bank with which Jones does business in Chicago, and which is called its correspondent. The draft when received in Chicago is presented to Jones at his place of business, who pays it by check or cash, or stamps or writes across its face:

ACCEPTED
JUNE 12, 1900.
PAYABLE AT
FIRST NATIONAL BANK.
JOHN JONES.

Or, he may write across the face simply "*Accepted*" and his name. The draft will then be paid at Jones' office when it falls due.

The draft in the former case becomes a check on Jones' account at the First National Bank when it is charged against his account. The bank in Chicago then credits and advises the bank in Philadelphia, which in turn credits Smith.

By courtesy Smith, when making the draft upon Jones, advises him at once of the fact, that he may be prepared to pay it.

If not paid, the draft is protested—that is, a formal statement of the fact of presentation is made by a notary and served upon drawer and all who have indorsed their names to the draft.

But if the drawer does not wish to incur the expense of protest fees, or to injure the credit of the debtor, there may be pinned to the draft a piece of paper with the words "No protest" upon it. This is to notify the bank presenting the draft that the drawer does not wish it protested if not paid. It is important that this slip of paper be detached before the draft is presented, or else the draft would lose its "force."

Drafts Differ from Checks.—When a draft is drawn a certain number of days after sight, or after date, it has three days of grace.

A check is practically a sight draft upon a bank; but there is a marked difference between a "check" and a "draft." For example: The form and wording are different; a check is drawn upon a bank or banker with whom funds have been deposited; a draft is drawn upon an individual or business house.

Checks are used for paying money to creditors; drafts are used as a means of collecting moneys due to the one drawing.

Checks, when properly drawn and presented, must be paid by the bank if it has funds belonging to the drawer.

The party drawn upon is under no obligation to honor a draft, if for any reason he chooses not to do so.

Due Bills.

A *Due Bill* is a formal written acknowledgment that a certain amount is due.

Due Bill for Money.

$200 $\frac{00}{100}$. Ho Hokus, N.J., July 15, 1900.

Due Charles Stillman, on demand, Two Hundred Dollars, value received.

Henry George.

It should in capitalization, punctuation, and arrangement of parts, follow the same rules as are followed for business letters.

Due bills are often given in settling accounts, when it is not convenient to make immediate payment.

Unlike promissory notes, due bills cannot properly be made payable *to order*. They are therefore non-negotiable.

The amount represented by a due bill should be expressed twice, as in a receipt, check, or note—once in writing, and once in figures.

Due Bill for Merchandise.

$55 $\frac{67}{100}$. Chicago, Ill., May 12, 1901.

Due Charles F. Thomas, for work done, Fifty-five $\frac{67}{100}$ Dollars, payable on demand, in merchandise, at my store.

William C. Edwards.

Promissory Notes.

A promissory note is a written promise to pay a specified sum of money at a designated time, both of which are stated in the body of the note.

The *holder* is the person who is in lawful possession of a note, whether he is the original payee or has received the note by indorsement.

Promissory notes are divided, in common usage, into three principal kinds: Individual Notes, Joint Notes, Joint-and-several Notes. Any of these notes may be either *negotiable* or *non-negotiable*.

An *Individual Note* is one signed by a single person.

$240 $\frac{00}{100}$. Chicago, Ill., May 11, 1901.

On demand, we promise to pay to the order of Samuel Barclay, at his office, Two Hundred Forty $\frac{00}{100}$ Dollars, value received.

Henry Ambrose,
Walter Williams.

A *Joint Note* is one signed by two or more persons who are *together* responsible for its payment, share and share alike.

A *Joint-and-several Note* is one signed by two or more persons, all of whom together, or *any one* of whom *separately*, may be held

for the whole amount. The words, *We jointly and severally promise*, which are found in this note, are equivalent to *We together and separately promise*. Accordingly, when such a note matures, if all the signers are able to pay, they contribute share and share alike; while if one or more cannot pay, the whole amount is paid by the remaining one or more.

$851\frac{60}{100}$. *Salem, N. J., Jan. 13, 1901.*

Three months after date, for value received, we jointly and severally promise to pay William Johns or order, at the Second National Bank, Eight Hnndred Fifty-one $\frac{60}{100}$ Dollars, with interest.

Henry Swartz.
Levi Douglass.

A note is made negotiable, that is saleable, by making it payable to a person, or his order, or to his assigns, or to bearer, or to the cashier of a bank or incorporated company. A note so drawn may be negotiated, or used in payment to another person by the holder; but he must indorse his name on the back of the note. Should the drawer of the note fail to pay it, the holder looks to the person or persons who indorsed it for payment.

A note payable on a certain day is usually due three days later. These three days are called *days of grace*. Thus a note for one month, dated March 1st, need not be paid until April 4th, the last day of grace. Notes payable on demand are not entitled to any grace. Should the last day of grace fall upon Sunday or upon a legal holiday, it must be paid on the day previous. Thus a note due December 25th, must be paid on the 24th of that month.

A note made payable at a bank and held there for payment until the usual hour for closing, need not be presented to the drawer in person to bind the indorser. It may be protested as in the case of drafts, immediately upon the close of bank-hours. Payment must be immediately demanded of the indorser if he resides in the same place; if he is a non-resident he must be notified at once by letter.

Discounting Note at Bank.

When notes are offered at bank they are passed upon by its officers or directors, or both, to satisfy themselves that the maker and indorsers are good for payment. If accepted the bank charges interest or discount at an agreed upon rate reckoned upon the face of the note for the time for which the note is to run from the day it is discounted. For instance a note for $500 drawn and dated April 1, 1901, payable in 3 months, would be due and payable July 1st or 4th. If offered at

No. *114* Amt. *$1300*

To *Alfred Sidney*

For *On ac.*

Payable *Merchants' N. Bank*

Time *3 mos.*

Due *June 13, 1901*

$1300\frac{00}{100}$. *Nyack, N. Y., Mch. 13, 1901.*

Three months after date, for value received, I promise to pay to the order of Alfred Sidney at the Merchants' National Bank, Thirteen Hundred $\frac{00}{100}$ Dollars.

Wm. B. White.

No. 114.

A Promissory Note and stub, showing record of note. This record may also be kept in separate book for notes payable and receivable.

bank for discount on May 1, 1901, the bank would reckon the interest from May 1st to July 4th. It is to be noted that the bank takes its interest in advance and pays to holder of note the proceeds which is the face value less the bank interest or discount. To compute the value of a note which reads "*with interest*," you add to the face value the interest which will be due at the maturity of note. Upon this value the bank reckons its discount.

Indorsements, a Summary.

Indorsements are entries written on the back of any paper, whether checks, notes or drafts. They show either a transfer of title, a giving of security, or a receipt for a payment applying on the contract indorsed.

We give here, plainly marked, the various forms of indorsements:

No. 1 is the more common and safest form. It transfers the ownership from Smith to Jones, and makes Smith responsible to Jones in case the maker or payer of the paper fails to pay it.

No. 2 transfers ownership, but relieves Smith from any responsibility if the paper is not paid when due. Only under special circumstances is this used.

No. 3 transfers the ownership to any party who may hold the paper, making it in effect payable to the bearer. Such paper should not fall in hands of strangers.

No. 4 transfers the ownership as in No. 3, except that it relieves Smith from further responsibility.

1	*(Transfer of Title.)*	Pay to the order of Henry Jones. JOHN SMITH.
2	*(Without Recourse.)*	Pay to Henry Jones, or order, without recourse. JOHN SMITH.
3	*(In Blank.)*	JOHN SMITH.
4	*(Blank—Without Recourse.)*	Without recourse. JOHN SMITH.
5	*(For Money paid.)*	Oct. 4, 1900., Received on within note Fifty ($50) Dollars.
6	*(For Collection.)*	Pay to the order of the Commercial National Bank of Lansing Mich., for collection. JOHN SMITH.
7	*(Protest Waived.)*	Notice and protest waived. JOHN SMITH.

When a paper is written payable to the order of John Smith, and he wishes to transfer his title to Henry Jones, he writes on the back of the paper an order for its payment to Jones.

For the convenience of bank-tellers and others who have large numbers of such indorsed papers to handle daily, it is well to write the indorsement across the left end of the paper.

On negotiable papers that are likely to have several indorsements, care should be taken to write the indorsements as close together as is convenient. If the back of the paper should be covered with indorsements, other indorsements can be written on blank paper attached to the original.

No. 5 is a receipt for money paid to apply on the promise indorsed. Such indorsements need no signature as it might have the effect of a receipt in full.

No. 6 does not transfer the ownership of the paper, but merely gives authority to collect the paper as Smith's agent and to place the amount collected to his account.

No. 7 relieves bank of responsibily of serving notice and protest.

Receipts.

A *Receipt* is a written acknowledgment, signed by the receiver and delivered to the giver, showing that certain property (money or goods, or both) has been received.

RENTAL RECEIPT.

Lease No. 2 November 1, 1900,

Received of Anna P. Johnston $475.00

Four Hundred Seventy-five 00/100 Dollars, being in full for the yearly rental on my farm of 150 acres, in Fifth District, Clinton Co. Ia. From Mar. 1, 1900 To Mar. 1 1901. In accordance with the terms of a lease to Alfred Johnston dated Nov. 1, 1899

George F. Hoar.

Every word which expresses number, unless connected with preceding word by a hyphen, may or may not begin with a capital. But there should be uniformity in this particular in papers drawn by same parties. The amount of money received is written in figures in the left-hand corner.

There are three kinds of receipts: (1) *Receiptsin Full;* (2) *Receipts on Account*, and (3) *Receipts to Apply on Particular Accounts.*

The first is given when the payment is a complete settlement; the second, when partial payment of a debt is made; the third, when there are more accounts than one between the persons, and the payment is intended to apply to a particular one.

(1)

$457 $\frac{00}{100}$. Akron, O., Jan. 12, 1901.

Received from George B. Waterson, Four Hundred Fifty-seven Dollars, in Full of all Demands.

Albert S. Lucien.

(2)

$341 $\frac{00}{100}$. Wilmington, Dela., Nov. 16, 1901.

Received from Lyman D. Willard, Three Hundred Forty-one Dollars, on account.

Charles F. Gibson,

Per Anna Brown.

(3)

$375 $\frac{75}{100}$. Portland, Ore., Aug. 17, 1901.

Received from B. Braddock, Three Hundred Seventy-five $\frac{75}{100}$ Dollars, to apply on rent of house.

Frank Berry.

[BILL OF SALE]

IN CONSIDERATION OF

Two Hundred Seventy-four . . . DOLLARS, receipt of which is hereby acknowledged, *I, S. D. Haag*, of County of Erie and State of Pennsylvania, do hereby sell and convey unto Peter Cline, of County of Erie, and State of Pennsylvania, the following described personal property.

Dark Bay Horse, "Nepos," 17½ Hands High, 1600 lbs. weight, with star on forehead and white on right hind foot.

And I do hereby covenant and agree to warrant and defend the above described personal property against the lawful claims af all persons.

Signed this 5th day of May, A.D. 1902,

S. D. HAAG.

Lease—Form A.

This Agreement, Made between .... *R. B. Congdon* .... of the County of .... *New Castle* .... and State of .... *Delaware* .... of the first part, and .... *C. S. Milligan* .... of .... *Wilmington, Delaware* .... of the second part, witnesseth: That the said party of the first part has this day leased unto the party of the second part the following described premises, to-wit: .... *The First Floor and Basement of the Storeroom* .... *No.* .... *199 Market* .... *Street* .... for the term of .... *One Year* .... from and after the .... *first* .... day of .... *March* .... A.D., 1901 ...., at the .... *Monthly* .... rent of .... *Thirty-seven 50-100 Dollars* .... to be paid as follows, to-wit: .... *On the date of this Lease and on each month thereafter in advance* .... And it is further agreed that if any rent shall be due and unpaid, demand therefor being waived, or if default be made in any of the covenants herein contained, it shall then be lawful for said party of the first part to re-enter the said premises and remove all persons and property therefrom, or he may recover possession thereof, by action for the forcible detention of said property as provided for in the laws of the state pertaining to rented property.

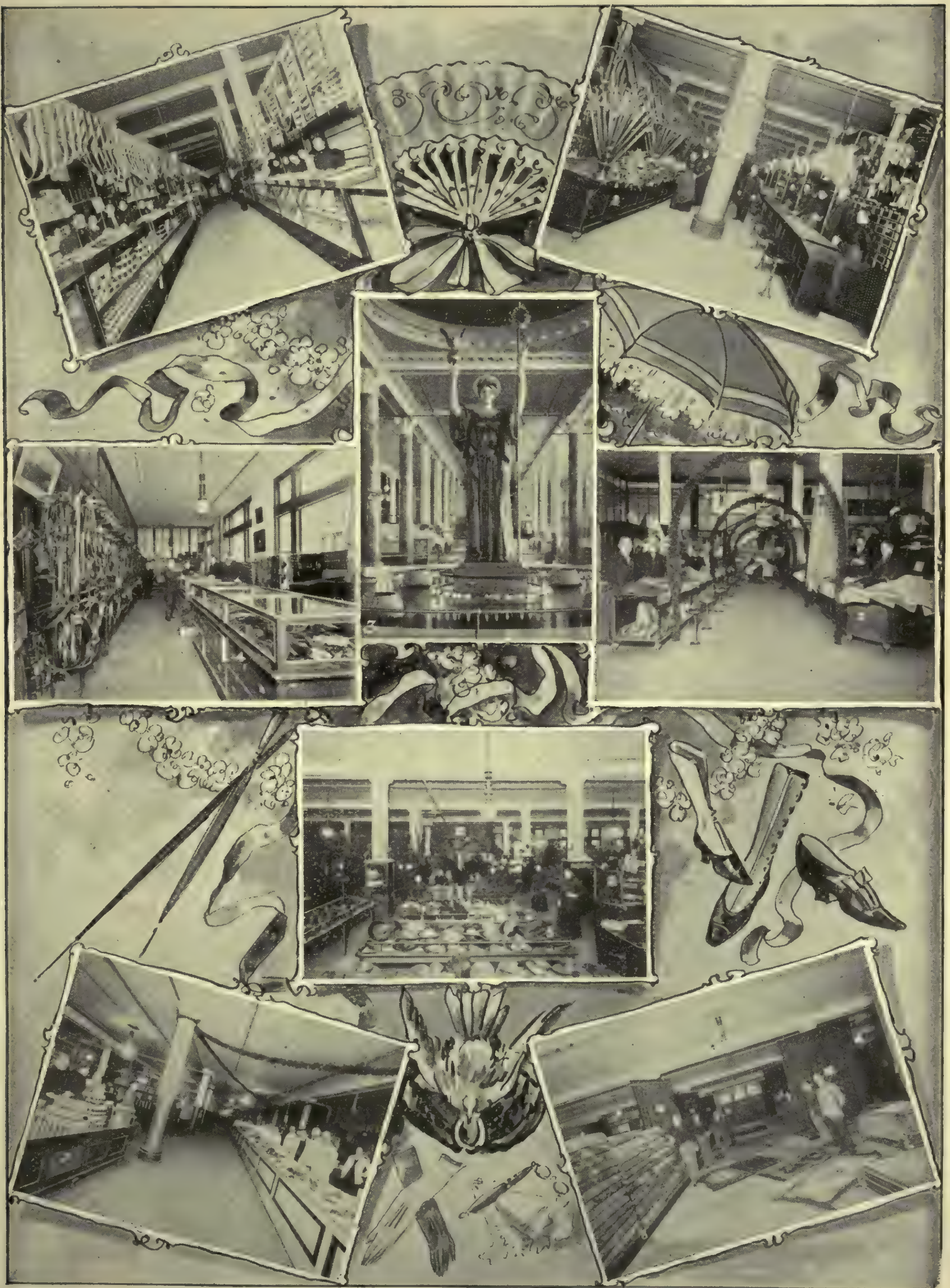
And the said party of the second part agrees to hire said premises, and to pay the party of the first part therefor the .... *Monthly* .... rent of .... *Thirty-seven 50-100 Dollars* .... to be paid as follows, to wit: .... *On the date of this lease and on each month thereafter in advance* .... except when said premises are untenable by reason of fire from any other cause than the carelessness of the party of the second part, or of persons of .... *his* .... family, or in .... *his* .... employ, or by superior force or inevitable necessity

And the said party of the second part covenants that .... *he* .... will use said premises as a .... *storeroom* .... and for no other purpose whatever; and that .... *he* .... especially will not use said premises nor permit the same to be used for any unlawful business or purposes whatever; that .... *he* .... will not assign this lease or let or underlet said premises without the written consent of the lessor, under the penalty of the forfeiture of all .... *his* .... rights under the lease; and that .... *he* .... will use due care and diligence in guarding said property from damage; that .... *he* .... will keep the same in such repair as the same now are, or may at any time be placed in by the lessor, damages by superior force inevitable necessity, or fire from any other cause than from the carelessness of the lessee, or persons of .... *his* .... family, or in .... *his* .... employ, excepted; and that at the expiration of this lease, or upon a breach by said lessee of any of the covenants herein contained .... *he* .... will, without further notice of any kind, quit and surrender the possession of said premises in as good condition as reasonable use, natural wear and decay thereof will permit, damages by fire as aforesaid, superior force, or inevitable necessity, only excepted.

IN WITNESS WHEREOF, the said parties have hereto subscribed their names on this .... *first* .... day of .... *March* .... A.D., 1901.

WITNESSES:	.... *R. B. Congdon* ....
.... *Charles Worth*	.... *C. S. Milligan* ....
.... *Henry Ryan*	....

Lease.—It is important both for the owner of the property and the one who rents it that the agreement be properly and carefully drawn, signed and witnessed. Each party to the agreement should keep a copy duly signed and witnessed.



THE DEPARTMENT STORE

The Department Store is one of the earliest and greatest combinations of many business enterprises under one management. These stores, as their name implies, have many departments, each complete in itself as will be seen in this illustration —Boots and Shoes—Clothing—Hardware—House Furnishings—Art Works and other lines are represented. It certainly facilitates trade by convenience of arrangement.

(ITEMIZED BILL RECEIPTED)

Los Angeles, Cal., *October 31,* 190–.

Mr. *EBEN HOLDEN*

To R. E. CARTWRIGHT & CO., Dr.

Accounts Rendered Monthly.

October	*2*	*14 yards Silk*	*at $1.60*	*$22*	*40*		
		7 " Lining	*" .18*	*1*	*26*		
		½ " Braid	*" .20*		*10*		
		26 " Muslin	*" .12½*	*3*	*25*		
		2 doz. Buttons	*" .37½*		*75*		
		15 yards Flannel	*" .33⅓*	*5*	*00*		
						$32	*76*

Received payment,

Nov. 15, 190–. *R. E. CARTWRIGHT & CO.*
Per. Bowers.

Making Out an Account and Receipting Bill.

When merchandise is sold or services are rendered a detailed statement should be made out. This* is called a bill, or an account. The *debtor* is the one who owes the money, and the *creditor* the one who receives it. Goods are said to be sold on account or credit when they are not paid for on delivery.

Business Correspondence.

Great importance attaches to business correspondence, for a large part of the world's business is done through the mails or by telegraph. To facilitate the handling of so much mail it is important that business letters should have a uniform style and one which will secure clearness and accuracy in statement. Before giving a few model forms we would call attention to the following points, which we may term

Essentials for a Business Letter.

Use good paper and envelopes and black ink.

Study to arrange your letter to give it the best possible appearance, leaving a margin of a half inch or more at the left of the page, and dividing the letter into paragraphs whenever a new subject is to be considered.

Re-write the letter rather than to have erasures or blots.

Do not write the letter with a pencil, and do not use foolscap paper.

Fold the letter neatly to fit the size of the envelope.

Use as few words as possible and state clearly what you have to say.

Give the address plainly, including street or post-office box, town, and state, or province. Address the envelope carefully and examine before sending.

Read the letter when written to assure yourself that there are no omissions or mistakes.

Keep copies of all important business letters and file letters received.

When writing to others for information enclose a stamp or prepaid envelope.

In writing letters requesting payment, employ only the most gentlemanly terms and polite language.

When addressing strangers use "Sir" or "Dear Sir." A married lady is addressed as "Madam" or "Dear Madam," an unmarried lady as "Miss" or "Dear Miss;" it is allowable also to say "Dear Madam." In writing to a firm, company, or a number of persons the address is "Gentlemen" or "Dear Sirs." Never use the abbreviation "Gents."

In replying to a letter first acknowledge its receipt and mention the date. Use sparingly contractions and abbreviations.

The closing words of letters should be "Yours truly," "Yours respectfully," "Respectfully yours," or "Respectfully."

How to Begin a Letter.

We give below a few forms for beginning letters, where the paper is not provided with a printed heading. The first line on ruled paper is generally about an inch and a half below the top of the page. This is the proper place to begin. On the first line, beginning near the center of the paper, is written the name of the town and state, or the number of the street, with the name of the town and state on the second line. On the line below follows the month, day and year; on the succeeding line, at the left, the name of the party to whom the letter is addressed; the next line or two lines are occupied with his post-office address, and on the following line the address proper, "Dear Sir," etc.

Kokomo, Ind.
October 25, 1903.

Mr. J. T. Terhune,
Lancaster, Pa.
Dear Sir:
We are pleased to acknowledge the receipt of your letter of the 10th inst., etc.

Kennet Square, Penna.
April 2, 1904.

Messrs. Kent & Tatnall,
211 Market Street,
Philadelphia, Pa.
Gentlemen:
Please ship me the following order of goods, etc.

Closing a Letter.

Never fail to sign a letter, using your full name, and write it clearly, that there may be no error in sending your reply. If a lady is writing to a stranger she should sign her name with her proper title "Miss" or "Mrs." preceding in parentheses. There are various forms of closing letters, of which the following are the more common:

Yours truly,
(Miss) Mary Jones.

I remain,
Yours respectfully,
E. G. Ziegler.

I am,
Yours truly.
Robert M. Worth.

To Charles M. Jones,
Ogontz, Pa.

How to Address an Envelope.

Commence the name a little to the left of the centre of the envelope, and about one-half way down from the top. Write the name of the party addressed, with the number of the street on a line below, a little to the right, the city or town on a line next below and to the right, and last the state or province. The county may be placed in the lower left hand corner. The following is an example:

J. H. HOUSTON,
98 Adams Street,
Toronto,
Canada.

We give here a few letters as models of the most common forms which occur in business. These will be sufficient to suggest what forms may be adopted for others.

Letter of Application.

749 Monroe St.,
Milwaukee, Wis.,
December 20, 1901.

Messrs. Gerhart & Co.,
121 La Salle Ave., Chicago.
Gentlemen:
I notice in this morning's "Eagle" your advertisement for a salesman, in reply to which I am pleased to offer my services.

I am twenty-nine years of age, and have had four years' experience in one of the leading houses of Milwaukee, in the employ of Messrs. Galt, Smith & Co., to whom I

respectfully refer you. I also enclose to you copies of letters of recommendation, which I trust will be satisfactory to you.

I *shall be pleased to arrange for an interview with you, if that be your pleasure. Awaiting your early commands, I am,*

Very truly yours,
Emery Earles.

A Letter Ordering Goods.

179 Jerome Avenue,
Guelph, Ontario,
January 5, 1902.

Messrs. C. B. Smith & Co.,
Toronto, Canada.

Gentlemen:

Please send me by express, as soon as convenient, the following books:

1. *Tennyson's Poems (Complete.)*
2. *Thomas' Algebra.*
3. *Hopkin's History of Canada.*

Please advise me of shipment and send an itemized bill, allowing the usual discount.

Very respectfully yours,
John A. Hewes.

Letter Asking for Settlement of Account.

Toronto, Ontario,
April 1, 1902.

Mr. John A. Hewes,
Guelph, Ont.

Dear Sir:

We enclose a statement of your accout somewhat overdue, and shall feel greatly obliged for the settlement of the same at an early date, as we have several heavy payments to make.

Trusting that you will excuse us for troubling you, we are,

Very truly,
C. R. Smith & Co.

Enclosing Statement of Account.

Cincinnati, Ohio,
April 1, 1903.

Messrs. Allibone & Simmons,
Terrehaute, Ind.

Gentlemen:

We enclose you herewith statement of your account for the last three months, which we believe you will find correct. We shall be glad to have you examine the same at your earliest convenience, and shall be happy to receive your check for the amount, or instructions to draw on you in the ordinary course.

We are, gentlemen,

Yours very truly,
R. C. Bancroft & Co.

Enclosing Remittance.

Boscobel, Wis.,
June 21, 1903.

John Wanamaker,
Philadelphia.

Dear Sir:

The goods ordered of you on the 5th inst. have been received and are entirely satisfactory in both quality and price. I enclose you herewith my check for $175.91, the amount of your bill, which kindly receipt and return.

Very truly yours,
Thomas Upton.

Opening an Account.

Jefferson City, Mo.,
September 15, 1902.

Messrs. R. B. Smith & Co.,
St. Louis, Mo.

Gentlemen:

I desire to open an account with you as I expect to have need to order frequently goods of the lines you carry, and it will be more convenient for me to settle the first of each month than to make remittance with each order. I am permitted to refer you to Dr. C. F. Peterson, 99 Monroe Street, of your city, who knows me well, and also Brown & Johnson, bankers of this city, who are well acquainted with my financial standing. Should my references prove satisfactory, will you kindly forward me at once by express, the following goods:

3 dozen Napkins at about $3.00.
2 boxes Ladies' Fine Hose.
3 dozen Ladies' Hemstitched Handkerchiefs at about $2.75.
15 yards of Gingham, light color about 18 cents.

Hoping my proposition to open an account will be satisfactory, and that the enclosed order may meet with your prompt attention, I am

Yours respectfully,
Peter Andrews.

Acknowledging Receipt of Order.

OFFICE OF
R. B. SMITH & CO.
200-25 DAUPHIN ST.

St. Louis, Sept. 21, 1902.

Peter Andrews,
Jefferson City, Mo.
Dear Sir:

Your favor of the 15th is received.

The references are quite satisfactory and we shall be pleased to have your account.

The goods ordered are now being packed, and we will ship them per Illinois Central to-morrow.

Thanking you for the order, and hoping your goods will reach you promptly and in good condition, we remain,

Very truly yours,
R. B. Smith & Co.
per S.

Practical Points for the Correspondent.

Abbreviations.—Use only authorized abbreviations, and attempt no short cuts of your own. Consult a dictionary when in doubt. Do not say "Phil." for "Philadelphia," or "G'n't'n" for "Germantown." Use "and," not the sign "&." Abbreviations denoting professional standing, as "M. D.," "D. D.," "LL. D.," and "M. A." are used chiefly on title pages. When used on letters the names are not preceded by titles such as "Mr.," "Professor," etc.

Address.—The name and address should be written plainly so that "N. Y." will not be mistaken for "N. J.," "Mo." will not be mistaken for "Me.," "Md." for "Ind.," nor "S. C." for "S. D."

Avoid fancy note paper. Avoid postals for private correspondence. Avoid flourishes. Avoid crooked lines. Avoid unusual colors in inks. Avoid grumbling on paper. Avoid slang. Avoid the capital "D" in "My dear Sir." Avoid erasures and blots. Avoid writing with pencil. Avoid frequent repetition of the same word. Avoid too many "and's" and "very's" and "so's" and "well's." Avoid the use of figures instead of words denoting numbers. Avoid awkward folding of the letter. Avoid matters of private confidence and friendship in business letters. Avoid delays in answering invitations. Avoid displaying temper in letters.

Dating Letters.—It is important to date the letters at the beginning, that it may not be overlooked, giving the day of the month and the year. The correct contractions for second, third, etc., are 2d, 3d, etc. In referring to other dates, "inst." refers to the present month, "ult." to the preceding month and "prox." to the following month, as "23d prox." means the 23d of next month. Care should be taken in using these abbreviations.

Initials.—Full names, not initials, should be used. It is difficult to know whether "R. Jones" means "Reuben Jones" or "Rebecca," or whether the writer should say "Mr. Jones" or "Miss Jones." One's own name should always be written legibly. Only cashiers are allowed fancy signatures.

Materials.—The best stationary only is good enough. Paper and envelopes should correspond in color and quality. Business letter sheets are either 5x8 (note size) or 8x10 inches (letter size.)

Mistakes.—Over 5,000,000 letters go astray each year on account of mistakes in envelope addressing. Letters are sent with money enclosures and orders for goods, which the sender never hears from, for there is no address in the letter, or the signature may be omitted; therefore, don't make mistakes.

Official Letters.—It is better to say, "To the Commissioner of Patents, etc., Sir," than to say "To the Honorable A—— S——, Commissioner of Patents, etc.," and if the writer is an official, it is proper for him to place his title after or below his signature.

One Side.—Write on one side only of the paper in business correspondence, that copies may be easily taken.

Ordering Goods.—Give complete directions as to method of shipment, whether by railway or other transportation, and state explicitly the kind and amount of goods you wish shipped. Also state the amount of money you enclose in your letter, or how it will be sent.

Return Postage.—In writing about your own affairs, requiring an answer, it is proper to enclose a stamp or stamped envelope.

Spelling.—A small dictionary of common words is an important adjunct to everyone's writing desk. Good spelling only comes from practice and experience in careful reading.

Style.—The general appearance of a letter depends upon the degree of attention given it as to its legibility, correct spelling, paragraphing and punctuating, and also to the freedom from blots, interlineations and erasures. Style also depends upon the beginning and ending of the letter, that they be uniform and artistic in arrangement.

Telegrams.—Correspondence by telegraph is expensive, and such communications are called "messages." They should be brief, concise, and give exact meaning. They should not omit necessary words or be capable of more than one meaning. It is always best to write carefully what you wish to state, recast it, if possible, to say the same thing in fewer words. See that the name and address are plainly written, and your own name and address are signed. Omit all forms of salutation at beginning and close of the message. The following shows a concise message:

Philadelphia, Pa.

John W. Ferris,
Central Block
Pueblo, Colorado.

Father very ill. Come immediately. Draw on me for funds.

WILLIAM FERRIS.

PRACTICAL BOOKKEEPING

WHY ACCOUNTS ARE KEPT—PROFITS AND LOSSES—RECORDS OF BUSINESS TRANSACTIONS—SINGLE ENTRY BOOKKEEPING—A MODEL SET OF ACCOUNTS—DOUBLE ENTRY—THE BOOKS USED—A MODEL SET OF DOUBLE ENTRY ACCOUNTS—TRIAL BALANCES

THE SCIENCE OF ACCOUNTS

Bookkeeping is both a science and an art. It is based upon custom and utility, the principles of which have been formulated into general laws, which have been adopted throughout the business world. In this sense it is a science. The recording and mechanical part, including the accuracy in arrangement of business transactions, is the art. To become efficient in both the science and the art it is necessary to master the principles and laws and apply them with accuracy and rapidity.

The object of bookkeeping is to keep an exact record of the amount of money, merchandise and other properties received and disposed of, and the amount of each on hand.

Bookkeeping is practiced in two ways or methods, which are known as *single* and *double* entry. In opening up a business, the business itself is the first thing to be considered; the recording or specifying the transactions is secondary. The former will determine largely the method to be followed.

Every man, whether he be a laboring man, farmer, tradesman, or professional man, should keep a record of all dealings which require a record of the receipt and expenditure of cash. Every wage-earner should take a few minutes at the close of each day to make a record of his cash, as well as the articles he has purchased during the day and had charged. When this is done there will be great satisfaction in knowing how the money has been spent, and ofttimes much assistance in checking needless expenditure. A farmer can make use of a simple form of bookkeeping in keeping a record of the cash he receives for the different products of the farm, and the cash expended for improvements, for material, and for labor. It will not be difficult for him to determine with great certainty which department of farming that he has tried yields the best returns. He should open an account with each one of his laborers, entering under the name a memorandum of the terms of the agreement, with the former address of the employee. In keeping an account with a person to whom goods are sold, when the account is paid in full it should be closed. If only a part is paid, credit should be given and the account closed, with the balance brought forward. A farmer can also, as we have said, keep an account with any department of his work, such as his wheat field, his corn field, or his cattle, charging to each the labor, seed, fertilizer, etc., and crediting to it the returns from the sale of the crop and the value of such portions as may have been used on the farm. In the same way, a mechanic should keep an account of each piece of work that he undertakes, especially if it be on contract, that he may ascertain the amount of his profit or loss. This will be a good guide to him for future estimates. These accounts are commonly called Property Accounts, and may be kept in the same form

as used for Personal Accounts, that is, accounts kept with individuals.

The Books Used in Single Entry Bookkeeping.

The different books used in bookkeeping will be learned as we follow the forms given on the succeeding pages. The three important ones are:

The Cash Book. This is used to show all receipts and payments of cash, and also all personal debits and credits for cash, which must be entered in the ledger.

The Day Book. This book is used to keep a record of transactions for which cash is not paid or received, but the amounts of the transactions are to be entered in their proper places in the ledger, as indicated in the day book. Every transaction entered in the day book indicates that the person or account so entered is either debtor (Dr.) or creditor (Cr.) in reference to the one who owns or manages the business represented by the book. This book is generally ruled with two amount columns, the first being for the items of transaction, and the second for the total of these items.

The Ledger. This is not a book of original entries, but is a record of what has been first entered in another book, such as the *Cash Book* and *Day Book*, *Notes Receivable* and *Payable Books*, *Blotter*, and such other books as may be required, depending on the nature and extent of the business; hence, items do not appear in the ledger; but in a column ruled for that purpose is placed the folio or page of the book from which the entry is posted, as entries made in day book and cash book give a history of the transaction. They are sometimes called *Historical Entries*.

It is best to observe the following directions for entering items in the cash book and day book:

1. Be uniform in describing transactions of the same kind.

2. Every transaction should have an entry made on the day on which it occurs.

3. The quantity and price of each item should be given iu entering sales on account; likewise in recording purchases on account.

4. Do not erase or interline any entries made in cash book or day book. If any errors are made mark them "Void" and make the entry a new one. This will show that no fraud was intended if the books are examined in court. Corrections and erasures may be made in ledger and other books, although these should be avoided.

5. Exercise great care in writing figures, as corrections cannot be easily made.

Single Entry Bookkeeping.

Single entry bookkeeping is simple, and is generally adopted by shop people and small concerns who deal in a great variety of articles and where the sales are small and numerous. This method affords some knowledge of the condition of the business to the proprietor; by this system it often seems a tedious method to enter each sum singly in the ledger. The ledger contains the names of all parties with whom transactions take place. The debtor and the creditor accounts of each party are arranged on the opposite pages, the debtor being on the left-hand side and the creditor on the right. Thus, if merchandise is sold to A, A is made debtor (Dr.) to merchandise and merchandise is made creditor (Cr.) to A. The key to bookkeeping is found in the following: *Debit what is received or what costs value; credit what is parted with or what produces value.* The person from whom you buy goods or receive money is the *Creditor*, and those to whom you sell goods on credit or pay money is the *Debtor*. When a thing is received its account is debited; when cash is received, cash is debited; merchandise, merchandise is debited; hence, when a person receives something of value from us without giving value in return we debit that person. When cash is paid out, cash is credited; merchandise is sold, merchandise is credited.

The cash book not only is very useful, but quite essential whether kept by single or double entry. When you receive money you enter it on the debtor's side or left-hand page; when you pay out money you enter the sum on the credit or right-hand page; the difference between two sides of a cash book will always show

a debit balance which is equal to amount of cash on hand. The credit side of the account can never be larger (unless your account is overdrawn) than the debit side, since it is impossible to pay out more cash than has been received. To close the cash account write on the credit side, in red ink, the total amount on hand and the word *balance*, and bring the balance down on the opposite side in black ink, as above:

Cash Book.

190	Dr.			Cr.	
April 2.	To H. F. B.,	4000.00	April 5.	By Interest,	50.00
" 5.	" Note,	500.00	" 15.	" S. Conrad,	60.00
" 26.	" Sundries,	500.00	" 24.	" Expense,	90.00
			" 30.	" Balance, (*in red*)	4800.00
		5000.00			5000.00
April 30.	To balance,	4800.00			

Diagram I.

	Dr.			Cr.	
Jan. 2.	To Cash,	100.00	Feb. 4.	By Expense,	30.00
				" Balance,	70.00
		100.00			100.00

As can be seen, the balance is obtained by adding the amount paid out, $200.00, and deducting from the total amount received, $5,000.00, the remainder being the amount on hand, $4,800.00.

Diagram II.

CASH.

	Dr.			Cr.	
Jan. 1.	To Invest Account,	1000.00	Feb. 20.	By Repairs,	150.00
" 1.	" Cash,	2000.00		" Paper,	100.00
" 1.	" Sales,	500.00		" Labor,	500.00
" 1.	" Note,	500.00		" Expense,	50.00
				" Presses,	2,000.00
				" Equipment,	1,200.00
		4000.00			4000.00

A person doing a strictly cash business needs only one book, the cash book, and on its proper side all transactions are written. For instance, in Diagram I, his cash book shows, on the debtor side, a transaction of $100.00, and on the credit side $30.00; the difference is $70.00, the sum he should have on hand. In Diagram II the record of transactions appears complete, and no other book is required for the business.

Suppose, however, you are a merchant and your customers keep running accounts. You will then find it necessary to have a day book, cash book, and ledger. For example, a customer, Mr. J. G. Howard, comes in and asks for a statement of his account. Looking up the name in the index to the ledger, we find Mr. Howard on folio 78. Turning to his account we discover the following, as in Diagram III. The debtor side, or what he owes you, is $288.50; the credit side, or what you owe him, or what has been paid, is $260.00, the difference being $28.50, this being in your favor and, therefore, is debit to you; if he

pays the $28.50, enter it on creditor side of ledger, *By Cash 28.50*, debit your cash book, and then rule off the account with two parallel short lines in red as both sides of the account will then be the same.

Diagram III.

J. G. Howard.

1901	Dr.		1901	Cr.	
Jan. 1.	To Mdse.,	$200.00	Jan. 1.	By Cash,	$60.00
" 15.	" "	30.00	" 14.	" Note,	100.00
" 25.	" "	58.50	" 17.	" Cash,	50.00
			" 19.	" Note,	50.00
				" Balance,	28.50
		$288.50			$288.50
	To Balance,	$28.50			

A TRIAL LIST OF TRANSACTIONS

The following items will be found written up in the Day Book, Cash Book, Ledger, Bills Receivable and Bills Payable Books of succeeding pages. They should be carefully traced through the respective books and the reasons for their being so entered will be evident. Then the learner will do well to procure paper properly ruled and write up the transactions for himself. First reproduce by copying and afterward try to write up the whole set from the list given here; then compare and correct errors. In this way he will be able to master the subject.

190 .			
Jan. 1.	Began business with		$4,000
	Bought goods as follows of		
	E. J. White,		300.40
	Henry Short,		482.00
	Mrs. Pearce Cook,		600.00
	Ralph Wilson,		248.60
	Sold merchandise for cash,		29.60
Jan. 2.	Paid E. J. White,		160.00
	Paid Henry Short,		240.00
	Paid Mrs. Pearce Cook,		300.00
	Paid Ralph Wilson,		122.00
	Gave notes to		
	E. J. White, 2 mos.,		80.00
	Henry Short, 2 mos.,		180.00
	Mrs. Pearce Cook, 3 mos.,		120.00
	Ralph Wilson, 1 mo.,		80.00
	Bought merchandise of		
	M. Young,		397.28
Jan. 3.	Sold to Jones & Co. merchandise as follows:		
	Paper,	48.00	
	Books,	52.80	
	Pads,	44.00	144.80
	Received Jones & Co. merchandise,		72.40
	3 mos. note,		72.40
	Sold A. Daniel, merchandise,		101.60
	Received from A. Daniel, cash,		40.00
	3 mos. note,		61.60
Jan. 5.	Sold to Bowers & Co., merchandise,		148.64
	Received from Bowers & Co., 2 mos. note,		148.64
	Paid M. Young, note paid to me by A. Daniel,	61.60	
	Also the 2 mos. note of Bowers & Co.,	148.64	210.24
	Bought of W. Henderson, merchandise,		240.00
	Sold him merchandise,		164.60
	Sold for cash, merchandise,		13.20
Jan. 6.	Paid wages,		8.44
	Paid expenses,		13.20
Feb. 5.	Paid note, Ralph Wilson,		80.00
Mar. 5.	Paid note, E. J. White,		80.00
	Paid note, Henry Short,		180.00
Apr. 5.	Paid note, Mrs. Pearce Cook,		120,00
	Received note of Jones & Co.,		72.40
Apr. 7.	A. Daniel's note returned by M. Young not honored,		61.60
Apr. 8.	Paid rent,		160.00
	Paid personal tax,		40.48
	Paid real estate tax,		30.40
May 1.	Sold merchandise to		
	Mackay & Co.,		40.00
	M. H. Smith,		36.48
	A. M. Jenks,		160.00
	E. Soley,		240.00
	F. M. Johnson,		148.40
Jun. 1.	Received the following notes at 3 mos.:		
	Mackay & Co.,		40.00
	M. H. Smith,		36.48
	A. M. Jenks,		160.00

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THE GREATEST FINANCIAL TRANSACTION IN THE WORLD'S HISTORY.
The purchase and payment for the Panama Canal, in 1904, by the United States was the greatest transaction in the history of finance. This picture shows men packing for shipment $6,500,000, being the first instalment paid by the United States to France for the Panama Canal.

January 1, 190-

	Began business this day, investing $4,000.00 in cash.				
	″				
10	E. J. White. Cr.			300	40
	Bought of him as per invoice.				
	″				
12	Harry Short. Cr.			482	00
	Bought of him as per invoice.				
	″				
13	Mrs. Pearl Cook. Cr.			600	00
	Bought of her as per invoice.				
	″				
14	Ralph Wilson. Cr.			248	60
	Bought of him as per invoice.				
	″				
15	M. Young. Cr			397	28
	Bought of him as per invoice.				
	3				
16	Jones & Co. Dr.			144	80
	Sold them the following goods, ½ cash, balance on note at 3 mos.				
	Books.	52	80		
	Paper 48.00 and Pads. 44.00	92	00		

This page and others of the series have been prepared for this work by an expert accountant and by Professor R. S. Collins, the Eminent Business College Instructor and Penman. The simplest and most approved forms used in Bookkeeping are shown. Full instructions are given in the text

Dr. Cash.

190–							
Jan. 1	1	Your name	Investment.	4000	00		
" 2	✓	Mdse.	Cash sales	29	60		
" 3	17	A. Daniel.	On acct.	40	00		
" 4	✓	Mdse.	Cash sales.	13	20	4082	80
						4082	80
Feb. 1		Balance on hand.				3239	16
						3239	16
Feb. 5		Balance on hand.				3159	16

Single Entry.—Explanations.

The Journal.—On page 59 all the items of the trial list that belong to the Journal will be found in their proper places. Page 54 is prepared to show you how these will appear when neatly written in the Journal. As the $4,000.00 item does not appear in the Ledger account, but does appear in the cash, it is not carried out to the dollars' and cents' column. You will note that in the Journal in the open unruled space at the top is the date of opening the business. Each succeeding date of that month, as 3, 5, 7, and so on, is written down the centre of the page at the opening of that day's transactions. Each transaction has below it a line in black, broken in the centre with two dots. At the left in a column is the folio in the Ledger to which that item is carried. Cr. and Dr. indicate on which side of the account in the Ledger the item is posted. The account is *credited with what is received from it, and debited with what is sold to it*, as will be seen. Where two or more items are specified, the amount of each item appears in the first column for dollars and cents, and the total amount is carried to the second column.

The Cash Book.—On pages 56 and 57 is shown how the two sides of the Cash Book should be written, the debit side being on the left and the credit side on the right, facing each other. On pages 60, 61, the single entry cash for this is shown complete. Enough should be told in entering each account to explain the transaction. It will be noticed that there are rulings at the left for the date and Ledger folio, and the right two columns for dollars and cents, the second of which is used in balancing the account at the end of the month, or at any given period. The line down the centre of the page of the Cash Book is usually a pale blue line for convenience of the bookkeeper in arranging his explanation to the right of it. It is not a necessary line. At the end of each month it is well to balance the Cash Book, and begin the next month by bringing down the balance on hand. The debit side of the cash account represents the money received, the credit side the money paid out. The debit side should always exceed the credit side in the cash account. *Balance on Hand*, marked with a star, is usually written in red ink, as also is the double line drawn beneath. You should also note where the single and double horizontal lines begin and end.

Cash. Cr.

190-							
Jan. 2	10	E. J. White.	On acct.	160	00		
" 2	12	Harry Short.	"	240	00		
" 2	13	Mrs. Pearl Cook.	"	300	00		
" 2	14	Ralph Wilson.	"	122	00		
" 2	✓	Expense.		21	64	843	64
* " 31		Balance on hand				3239	16
						4082	80
Feb. 5	✓	Bills Payable. No. 4.		80	00	80	00
* " 5		Balance on hand.				3159	16
						3239	16

The Ledger.—As the story of each transaction is told in the Cash Book, Day Book, or Bills Receivable Book, the Ledger does not furnish a history of each transaction; therefore less space will be required, and both sides of the account, the debit and credit, may be kept on one page, while in the Cash Book two pages are required for the accounts. The rulings for the Ledger, as you will observe, are entirely different from those of the preceding books. Spaces are provided for the date, for the folio of the Cash Book or Day Book, and for dollars and cents. Every item found in the Ledger should have a reference back to another book, where explanation can be found of the transaction.

How Accounts are arranged in the Ledger. While you may give one full page of the Ledger to each account, it will often be found more convenient to arrange two, or even three accounts on a page. The first, of course, will be at the top, and the second one, half way down. The name of the account is always written in large script in the centre of the page, from left to right, with Dr. and Cr. at the left and right respectively. The year may be written either immediately below or above the top line. If any one account is an important one, which is likely to be used freely, and which may contain many items, it will be best to allow it a full page. When all the space on any given page is filled, the account is transferred to another page by closing it with the words, "To" or "By Balance carried to Folio (—)" and beginning the transferred account on the new page with the words, "By," or "To Balance from Folio (—)" On page 58 are shown three accounts written up as they would appear in the Ledger, on three different folios, namely, 10, 12 and 13. Taking the first account, E. J. White, the first item of $160.00 is brought from the Cash Book and indicated by "1" in the folio column. The second item on the debit side, $80.00, is from the Bills Payable Book, and on the credit side item $300.40 brought from the Day Book, as indicated by the folio "1." As the credit side exceeds the debit side by $60.40, we write on the debit side in red ink, "June 30, Balance $60.40," beneath which we draw one horizontal line on each side, in red, bring down the total $300.40 beneath, draw double red line, and the account is closed for the half year. The balance of $60.40 is brought down under the credit side, indicating that we are in debt to E. J. White to that amount. It may be observed that in writing up this set of accounts the beginner should follow particularly the style indicated by the *script* pages of Journal, Cash and Ledger.

Folio 10.

Dr. E. J. White. Cr.

190-						190-					
Jan.	2	Cash	1	160	00	Jan.	1	Day Book	1	300	40
"	2	Bills Pay.	1	80	00						
*June	30	Balance		60	40						
				300	40					300	40
						June	30	Balance		60	40

Folio 12.

Dr. Harry Short. Cr.

190-						190-					
Jan.	2	Cash	2	240	00	Jan.	1	Day Book	1	482	00
"	2	Bills Pay.	2	180	00						
*June	30	Balance		62	00						
				482	00					482	00
						June	30	Balance		62	00

Folio 13.

Dr. Mrs. Pearl Cook. Cr.

190-						190-					
Jan.	2	Cash	3	300	00	Jan.	1	Day Book	1	600	00
"	2	Bills Pay.	3	120	00						
*June	30	Balance		180	00						
				600	00					600	00
						June	30	Balance		180	00

LEDGER—SINGLE ENTRY. This page should be studied and copied as it is a model for penmanship, arrangement and ruling. * Line is written in *red*.

January 1, 190–.

	Began business this day, investing $4,000 in cash				
10	*E. J. White, Bought of him as per invoice* Cr.			300	40
12	*Harry Short, Bought of him as per invoice* Cr.			482	00
13	*Mrs. Pearl Cook, Bought of her as per invoice* Cr.			600	00
14	*Ralph Wilson, Bought of him as per invoice* Cr.			248	60
15	*M. Young, Bought of him as per invoice* Cr.			397	28
	3				
16	*Jones & Co.,* Dr.			144	80
	Sold them the following goods, ½ cash balance on note at 3 months				
	Books	52	80		
	Paper $48.00 and Pads $44.00	92	00		
17	*A. Daniel, Sold him Mdse.* Dr.			101	60
18	*Bowers & Co., Sold them Mdse.* Dr.			148	64
15	*M. Young, Paid him notes* Dr.				
	A. Daniel	61	60		
	Bowers & Co.	148	64	210	24
19	*W. Henderson, Bought of him Mdse.* Cr.			240	00
19	*W. Henderson. Sold him Mdse.* Dr.			164	60
20	*Mackey & Co., Sold them Mdse.* Dr.			40	00
21	*M. H. Smith, Sold him Mdse.* Dr.			36	48
22	*A. M. Jenks, Sold him Mdse.* Dr.			160	00
23	*E. Solly, Sold him Mdse.* Dr.			240	00
24	*F. M. Johnson, Sold him Mdse.* Dr.			148	40
	June 20				
25	*Gerhart & Co., Bought of them Mdse.* Cr.			104	40
26	*Woolson, Williams Co., Bought of them Mdse.* Cr.			400	00
27	*George Page, Bought of him Mdse.* Cr.			348	80
28	*D. Adams, Bought of him Mdse.* Cr.			341	60

DAY BOOK—SINGLE ENTRY. Sometimes called *Journal.* Dr. and Cr. indicate the left and right side of Ledger to which the different items are posted from Day Book. Ledger Folio is at the left.

Dr. —Cash—

DATE	FOLIO IN LEDGER			
Jan. 1	×	*Capital, cash invested in the business*	4,000	00
Jan. 2	×	*Cash for sundry sales this day*	29	60
Jan. 3	17	*A. Daniel, payment on account*	40	00
Jan. 4	×	*Cash for sundry sales*	13	20
			4,082	80
Feb. 1	×	*To Balance*	3,239	16
March 1	×	*To Balance*	3,159	16
April 1	×	*To Balance*	2,899	16
	×	*Bills Receivable, No. 1*	72	40
			2,971	56
June 30		*Balance*	2,559	08

CASH BOOK—SINGLE ENTRY. All moneys received are entered on this page and posted to the Cr. column of Ledger and folio entered in column at left.

—*Cash*— *Cr.*

DATE	FOLIO IN LEDGER			
Jan. 2	10	*E. J. White*	160	00
	12	*Harry Short*	240	00
	13	*Mrs. Pearl Cook*	300	00
	14	*Ralph Wilson*	122	00
	×	*Expenses*	21	64
			843	64
		Balance [written in red]	3,239	16
			4,082	80
Feb. 5	×	*By Bills Payable, No. 4*	80	00
		Balance [written in red]	3,159	16
			3,239	16
March 5	×	*Bills Payable, No. 1*	80	00
		No. 2	180	00
			260	00
		Balance [written in red]	2,899	16
			3,159	16
April 5	×	*Bills Payable, No. 3*	120	00
April 7	17	*Protested Note, A. Daniel*	61	60
April 8	×	*Rent*	160	00
April 8	×	*Tax*	40	48
April 8	×	*Tax*	30	40
			412	48
		Balance [written in red]	2,559	08
			2,971	56

CASH BOOK—SINGLE ENTRY. All moneys paid out are entered on this page and posted to the Dr. side of Ledger and olio entered in column at left. These pages should be written up on properly ruled paper like the script cash pages preceeding.

Folio 10

Dr. **E. J. White** *Cr.*

Jan.	2	Cash	3	160	00	Jan.	1	Day Book	1	300	40
Jan.	2	Bills Payable, No. 1		80	00						
June	30	Balance		60	40					300	40
				300	40	June	30	Balance		60	40

Folio 12

Dr. **Harry Short** *Cr.*

Jan.	2	Cash	3	240	00	Jan.	1	Day Book	1	482	00
Jan.	2	Bills Payable, No. 2		180	00						
June	30	Balance		62	00					482	00
				482	00	June	30	Balance		62	00

Folio 13

Dr. **Mrs. Pearl Cook** *Cr.*

Jan.	3	Cash	3	300	00	Jan.	1	Day Book	1	600	00
Jan.	2	Bills Payable, No. 3		120	00						
June	30	Balance		180	00					600	00
				600	00	June	30	Balance		180	00

Folio 14

Dr. **Ralph Wilson** *Cr.*

Jan.	2	Cash	3	122	00	Jan.	1	Day Book	1	248	60
Jan.	2	Bills Receivable, No. 4		80	00						
June	30	Balance		46	60					248	60
				248	60	June	30	Balance		46	60

Folio 15

Dr. **M. Young** *Cr.*

Jan.	5	Bills Receivable, No. 2 and 3		210	24	Jan.	1	Day book	1	397	28
June	30	Balance		187	04					397	28
				397	28	June	30	Balance		187	04

Folio 16

Dr. **Jones & Co.** *Cr.*

Jan.	3	Goods		144	80	Jan.	3	Cash		72	40
								Bills receivable, No. 1		72	40
				144	80	June	3			144	80

Folio 17

Dr. *A. Daniel* **Cr.**

Jan.	3	Merchandise	1	101	60	Jan.	3	Cash	2	40	00
				101	60	June	3	Bills Receivable, No. 2		61	60
										101	60
June	30	Note Protested	3	61	60						

Folio 18

Dr. *Bowers & Co.* **Cr.**

Jan.	5	Merchandise	1	148	64	Jan.	5	Bills Receivable, No. 3		148	64
				148	64					148	64

Folio 19

Dr. *W. Henderson* **Cr.**

Jan.	5	To Merchandise	1	164	60	Jan.	5	Day Book	1	240	00
June	30	Balance		75	40					240	00
				240	00	June	30	Balance		75	40

Folio 20

Dr. *Mackey & Co.* **Cr.**

Jan.	3	Merchandise	1	40	00	June	1	Bills Receivable, No. 4		40	00
				40	00					40	00

Folio 21

Dr. *M. H. Smith* **Cr.**

May	1	Merchandise	1	36	48	June	1	Bills Receivable, No. 5		36	48
				36	48					36	48

Folio 22

Dr. *A. M. Jenks* **Cr.**

May	1	Merchandise	1	160	00	June	1	Note, Bills Receivable, No. 6		160	00
				160	00					160	00

Folio 23

Dr. *E. Solly* **Cr.**

May	1	Merchandise	1	240	00	June	1	Bills Receivable, No. 7		240	00
				240	00					240	00

FOLIO 24

Dr. — ***F. M. Johnson*** — **Cr.**

May	1	Merchandise	1	148	40	June	1	Bills Receivable, No. 8		148	40
				148	40					148	40

FOLIO 25

Dr. — ***Gerhart & Co.*** — **Cr.**

June	30	Bills Payable, No. 5		104	40	June	20	Goods as per Invoice	1	104	40
				104	40					104	40

FOLIO 26

Dr. — ***Woolson, Williams & Co.*** — **Cr.**

June	30	Bills Payable, No. 6		400	00	June	20	By Goods	1	400	00
				400	00					400	00

FOLIO 27

Dr. — ***George Page*** — **Cr.**

June	30	Bills Payable, No. 7		348	80	June	20	By Goods, per Day Book	1	348	80
				348	80					348	80

FOLIO 28

Dr. — ***D. Adams*** — **Cr.**

June	30	Bills Payable, No. 8		341	60	June	20	By Goods		341	60
				341	60					341	60

June 30, 19 —*Balance Sheet*—

Dr. — **Cr.**

FOLIO IN LEDGER		BALANCE AS PER LEDGER		FOLIO IN LEDGER		BALANCE AS PER LEDGER	
	Cash on Hand	2,559	08	10	E. J. White	60	40
	Notes Due	624	88	12	Harry Short	62	00
	Protested Note	61	60	13	Mrs. Pearl Cook	180	00
	Stock Estimated at by Inventory	2,308	16	14	Ralph Wilson	46	60
				15	M. Young	187	04
				19	W. Henderson	75	40
					Notes Payable	1,194	80
						1,806	24
					Balance	3,747	48
		5,553	72			5,553	72
	June 30, Balance	3,747	48				

—Bills Receivable—

FOLIO	NUMBER OF BILL	ON WHOSE ACCOUNT	DATE	TIME	DUE	AMOUNT
16	1	*Jones & Co.*	*Jan. 3*	*3 mos.*	*April 6*	72.40
17	2	*A. Daniel*	*Jan. 5*	*2 mos.*	*March 8*	61.60
18	3	*Bowers & Co.*	*Jan. 5*	*2 mos.*	*March 8*	148.64
						282.64
20	4	*Mackey & Co.*	*June 1*	*3 mos.*	*Sept. 4*	40.00
21	5	*M. H. Smith*	*June 1*	*3 mos.*	*Sept. 4*	36.48
22	6	*A. M. Jenks*	*June 1*	*3 mos.*	*Sept. 4*	160.00
23	7	*E. Solly*	*June 1*	*3 mos.*	*Sept. 4*	240.00
24	8	*F. M. Johnson*	*June 1*	*3 mos.*	*Sept. 4*	148.40
						624.88

—Bills Payable—

FOLIO	NUMBER OF BILL	BY WHOM DRAWN	DATE	TIME	DUE	AMOUNT
10	1	*E. J. White*	*Jan. 2*	*2 mos.*	*Mar. 5*	80.00
12	2	*Harry Short*	*Jan. 2*	*2 mos.*	*Mar. 5*	180.00
13	3	*Mrs. Pearl Cook*	*Jan. 2*	*3 mos.*	*April 5*	120.00
14	4	*Ralph Wilson*	*Jan. 2*	*1 mo.*	*Feb. 5*	80.00
						460.00
25	5	*Gerhart & Co.*	*June 30*	*3 mos.*	*Sept. 2*	104.40
26	6	*Woolson, Williams & Co.*	*June 30*	*3 mos.*	*Sept. 2*	400.00
27	7	*George Page*	*June 30*	*3 mos.*	*Sept. 2*	348.80
28	8	*D. Adams*	*June 30*	*3 mos.*	*Sept. 2*	341.60
						1,194.80

BILL BOOK. The above are two pages of a separate book known as the BILL BOOK. In this, under *Bills Receivable* are entered in regular order, the notes and paper which the owner receives in the course of business.

Under *Bills Payable* are entered in regular order the record of the notes given to others or any paper issued. Each note is entered with its number. the dates when it was drawn, when due, with time it has to run and the amount of its face, together with name of parties signing which are known as the maker or makers of the notes. The folio at the left indicates where the account is found in the Ledger; each item in this book must appear in the Ledger. Bills Receivable appear on the *Cr.* side of Ledger and Bills Payable on *Dr.* side. The BILL BOOK is an important one to the business man and he should be careful in making his entries. He should refer to it daily to see what paper he has to pay and arrange therefor; also to see what paper becomes due and see that it is presented for payment at proper time and place. He must remember that if a note is made payable in a bank it must be there before the appointed time so that, if not paid by the maker, the endorser may be notified and held by a protest. If such notice be not given by proper officer the endorser can not be held. On the other hand, if you overlook time of payment for your own note (Bills Payable) and it goes to protest it causes annoyance and, if repeated, injuries your credit.

January 1, 190-

L.F.			Dr.		Cr.	
12	Mdse.		1631	00		
13		E. J. White			300	40
14		Harry Short			482	00
15		Mrs. P. Cook			600	00
16		Ralph Wilson			248	60
		2				
13	E. J. White		80	00		
14	Harry Short		180	00		
15	Mrs. Pearl Cook		120	00		
16	Ralph Wilson		80	00		
17		Bills Pay.			460	00
12	Mdse.		397	28		
19		M. Young			397	28
		3				
20	Jones & Co.		144	80		
12		Mdse.			144	80
18	Bills Rec.		72	40		
20		Jones & Co.			72	40
21	A. Daniel		101	60		
12		Mdse.			101	60

JOURNAL—DOUBLE ENTRY. This page should be studied and copied as it is a model for penmanship, arrangement and ruling. All horizontal lines are in black. Central vertical line is a faint blue one.

Folio 12.

Dr. Merchandise. Cr.

190-						190-					
Jan	1	To Sundries	1	1631	00	Jan	1	By Cash	1	29	60
"	2	" M. Young	1	397	28	"	3	" Jones & Co.	1	144	80
"	3	" Jones & Co.	1	72	40	"	3	" A. Daniel	1	101	60
"	5	" W. Henderson	2	240	00	"	5	" Bowers & Co.	2	148	64
June	20	" Sundries	2	1194	80	"	5	" W. Henderson	2	164	60
						"	5	" Cash	2	13	20
						May	1	" Bills Rec.	3	624	88
						*June	30	" Balance		2308	16
				3535	48					3535	48
July	1	To Balance		2308	16						

Folio 17.

Dr. Bills Payable. Cr.

190-						190-					
Jan	5	To Cash	1	80	00	Jan	1	By Sundries	1	460	00
"	5	" "	1	80	00	Apr	1	" "	3	1194	80
"	5	" "	1	180	00						
"	5	" "	1	120	00						
*June	30	" Balance		194	80						
				1654	80					1654	80
						July	1	By Balance		1194	80

LEDGER—DOUBLE ENTRY. This page should be studied and copied as it is a model for penmanship, arrangement and ruling. All horizontally and diagonally ruled lines are in *red*

Dr. —Cash—

DATE	FOLIO IN LEDGER			
Jan. 1	11	*Capital, cash invested in the business*	4,000	00
Jan. 2	12	*Cash for sundry sales this day*	29	60
Jan. 3	21	*A. Daniel, payment on account*	40	00
Jan. 4	12	*Cash for sundry sales*	13	20
			4,082	80
Jan. 1	×	*To Balance*	3,289	16
March 1	×	*To Balance*	3,159	16
April 1	×	*To Balance*	2,899	16
	18	*Bills Receivable, No. 1*	72	40
			2,971	56
June 30		*Balance*	2,559	08

CASH BOOK—DOUBLE ENTRY. All moneys received are entered on this page and posted to the Cr. column of Ledger and folio enterèd in column at left.

—*Cash*— *Cr.*

DATE	FOLIO IN LEDGER			
Jan. 2	13	*E. J. White*	160	00
	14	*Harry Short*	240	00
	15	*Mrs. Pearl Cook*	300	00
	16	*Ralph Wilson*	122	00
	33	*Expenses*	21	64
			843	64
		Balance [written in red]	3,239	16
			4,082	80
Jan. 5	17	*By Bills Payable, No. 4*	80	00
		Balance [written in red]	3,159	16
			3,239	16
March 5	17	*Bills Payable, No. 1*	80	00
	17	*No. 2*	180	00
			260	00
		Balance [written in red]	2,899	16
			3,159	16
April 5	17	*Bills Payable, No. 3*	120	00
April 7	21	*Protested Note, A. Daniel*	61	60
April 8	×	*Rent*	160	00
April 8	×	*Tax*	40	48
April 8	×	*Tax*	30	40
			412	48
		Balance [written in red]	2,559	08
			2,971	56

CASH BOOK—DOUBLE ENTRY. All moneys paid out are entered on this page and posted to the Dr. side of Ledger and folio entered in column at left. These pages should be written up on properly ruled paper like the script cash pages.

January 1, 190–.

L. F.			Dr.		Cr.	
12	*Merchandise*		1631	00		
13		*E. J. White*			300	40
14		*Harry Short*			482	00
15		*Mrs. Pearl Cook*			600	00
16		*Ralph Wilson*			248	60
	2					
13	*E. J. White*		80	00		
14	*Harry Short*		180	00		
15	*Mrs. Pearl Cook*		120	00		
16	*Ralph Wilson*		80	00		
17		*Bills Payable*			460	00
	//					
12	*Merchandise*		397	28		
19		*M. Young*			397	28
	3					
20	*Jones & Co.*		144	80		
12		*Merchandise*			144	80
	//					
12	*Merchandise*		72	40		
20		*Jones & Co.*			72	40
	//					
18	*Bills Receivable*		72	40		
20		*Jones & Co.*			72	40
	//					
21	*A. Daniel*		101	60		
12		*Merchandise.*			101	60
	//					
18	*Bills Receivable*		61	60		
21		*A. Daniel*			61	60
	5					
22	*Bowers & Co.*		148	64		
12		*Merchandise*			148	64
	//					
19	*M. Young*		210	24		
18		*Bills Receivable*			210	24
	//					
12	*Merchandise*		240	00		
23		*W. Henderson*			240	00

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January 5, 190–

L. F.			Dr.		Cr.	
18	*Bills Receivable*		148	64		
22		*Bowers & Co.*			148	64
		5				
23	*W. Henderson*		164	60		
12		*Merchandise*			164	60
		May 1				
24	*Mackey & Co.*		40	00		
25	*M. H. Smith*		36	48		
26	*A. M. Jenks*		160	00		
27	*E. Solly*		240	00		
28	*F. M. Johnson.*		148	40		
12		*Merchandise*			624	88
		June 1				
18	*Bills Receivable*		624	88		
24		*Mackey & Co.*			40	00
25		*M. H. Smith*			36	48
26		*A. M. Jenks*			160	00
27		*E. Solly*			240	00
28		*F. M. Johnson*			148	40
		20				
12	*Merchandise*		1194	80		
24		*Gerhart & Co.*			104	40
30		*Woolson, Williams & Co.*			400	00
31		*George Page*			348	80
32		*D. Adams*			341	60
		30				
24	*Gerhart & Co.*		104	40		
30	*Woolson, Williams & Co.*		400	00		
31	*George Page*		348	80		
32	*D. Adams*		341	60		
17		*Bills Payable*			1194	80
		11				
34	*Loss and Gain*		252	52		
33		*Expenses Account*			252	52

THE JOURNAL—DOUBLE ENTRY. Each item must be entered twice in the Ledger. Hence the name *double entry.* The Journal provides for this by a double column for dollars and cents, one representing the *Dr.* and the other *Cr.* entry in the Ledger. The folio numbers of the Ledger are entered at the left. The first date is at top of the page and each succeeding date follows in its place in centre of page. Each entry in Journal is followed by a broken ruled line. The vertical ruled line serves to divide the *Dr.* from *Cr.* items. Where several items are charged to one account the sum total only is placed against said item, as in first entry. Footings in lead pencil should be made of each dollars' and cents' column of Journal page to test accuracy, as these totals must agree.

Folio 10

Dr. *Cash* **Cr.**

Jan.	2	To Capital Account	1	4000	00	June	30	By Disbursements		1596	12
Jan.	2	" Hand		155	20			" Balance		2559	08
				4155	20					4155	20
June	30	To Balance		2559	08						

Folio 11

Dr. *Capital Account* **Cr.**

						Jan.	1	By Cash		4000	00

Folio 12

Dr. *Merchandise* **Cr.**

Jan.	1	To Sundries	1	1631	00	Jan.	1	By Cash	1	29	60
"	2	" "	1	397	28	"	3	" Jones & Co.	1	144	80
"	3	" "	1	72	40	"	3	" A. Daniel	1	101	60
"	5	" "	1	240	00	"	5	" Bowers & Co.	1	148	64
June	20	" "	2	1194	80	"	5	" W. Henderson	2	164	60
						June	5	" Cash	1	13	20
						May	1	" Sundries	2	624	88
						June	30	" Balance		3308	16
				3535	48					2535	48
June	30	To Balance		2308	16						

Folio 13

Dr. *E. J. White* **Cr.**

Jan.	2	To Bills Payable	2	80	00	Jan.	1	By Merchandise	1	300	40
Jan.	2	" Cash	2	160	00						
June		" Balance		60	40						
				300	40					300	40
						June	30	By Balance		60	40

Folio 14

Dr. *Harry Short* **Cr.**

Jan.	2	To Bills Payable	1	180	00	Jan.	1	By Merchandise	1	482	00
Jan.	2	To Cash	2	240	00						
June		To Balance		62	00						
				482	00					482	00
						June	30	By Balance		62	00

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Folio 15

Dr. *Mrs. Pearl Cook* Cr.

Jan.	2	To Bills Payable	1	120	00	Jan.	1	By Merchandise	1	600	00
Jan.	2	" Cash	2	300	00						
June		" Balance		180	00						
				600	00					600	00
						June	30	By Balance		180	00

Folio 16

Dr. *Ralph Wilson* Cr.

Jan.	2	To Bills Payable	1	80	00	Jan.	1	By Merchandise	1	248	60
Jan.	2	" Cash	2	122	00						
June		" Balance		46	60						
				248	60					248	60
						June	30	By Balance		46	60

Folio 17

Dr. *Bills Payable* Cr.

Jan.	5	To Cash	2	80	00	Jan.	2	By Sundries	1	460	00
Mar.	5	" "	2	80	00	June	30	" Sundries	2	1194	80
April	5	" "	2	180	00						
"	5	" "	2	120	00						
		" Balance		1194	80						
				1654	80					1654	80
						June	30	By Balance		1194	80

Folio 18

Dr. *Bills Receivable* Cr.

Jan.	3	To Jones & Co.	1	72	40	Jan.	1	By M. Young	1	210	24
"	3	" Cash	2	61	60	April	1	" Cash	1	72	40
"	5	" Bowers & Co.	2	148	64	June	30	" Balance		624	88
June	1	" Sundries	2	624	88						
				907	52					907	52
June	30	To Balance		624	88						

Folio 19

Dr. *M. Young* Cr.

Jan.	5	To Bills Receivable	1	210	24	Jan.	1	By Merchandise	1	397	28
		" Balance		187	04						
June	30			397	28					397	28
						June	30	By Balance		187	04

Folio 20

Dr. *Jones & Co.* **Cr.**

Jan.	3	To Merchandise	1	144	80	Jan.	3	By Bills Receivable	1	72	40
								" Cash	1	72	40
				144	80	Jan.	3			144	80

Folio 21

Dr. *A. Daniel* **Cr.**

Jan.	3	To Merchandise	1	101	60	Jan.	3	By Bills Receivable	1	61	60
April	7	" Protested Note	2	61	60	June	3	" Cash	1	40	00
								" Balance	1	61	60
June	30			163	20					163	20
		To Balance		61	60						

Folio 22

Dr. *Bowers & Co.* **Cr.**

Jan.	5	To Merchandise	1	148	64	Jan.	5	By Bills Receivable	2	148	64
				148	64					148	64

Folio 23

Dr. *W. Henderson* **Cr.**

Jan.	5	To Merchandise	2	164	60	Jan.	5	By Merchandise	1	240	00
June	30	" Balance		75	40						
				240	00					240	00
						June	30	By Balance		75	40

Folio 24

Dr. *Mackey & Co.* **Cr.**

May	1	To Merchandise	2	40	00	June	1	By Bills Receivable	2	40	00
				40	00					40	00

Folio 25

Dr. *M. H. Smith* **Cr.**

May	1	To Merchandise	2	36	48	June	1	By Bills Receivable		36	48
				36	48					36	48

FOLIO 26

Dr. **A. M. Jenks** *Cr.*

May	1	To Merchandise	2	160	00	June	1	By Bills Receivable	2	160	00
				160	00					160	00

FOLIO 27

Dr. **E. Solly** *Cr.*

May	1	To Merchandise	2	240	00	June	1	By Bills Receivable	2	240	00
				240	00					240	00

FOLIO 28

Dr. **F. M. Johnson** *Cr.*

May	1	To Merchandise	2	148	40	June	1	By Bills Receivable	2	148	40
				148	40					148	40

FOLIO 29

Dr. **Gerhart & Co.** *Cr.*

June	30	To Bills Payable	2	104	40	June	20	By Merchandise	2	104	40
				104	40					104	40

FOLIO 30

Dr. **Woolson, Williams & Co.** *Cr.*

June	30	To Bills Payable	2	400	00	June	20	By Merchandise	2	400	00
				400	00					400	00

FOLIO 31

Dr. **George Page** *Cr.*

June	30	To Bills Payable	2	348	80	June	20	By Merchandise	2	348	80
				348	80					348	80

FOLIO 32

Dr. **D. Adams** *Cr.*

June	30	To Bills Payable	2	341	60	June	20	By Merchandise	2	341	60
				341	60					341	60

FOLIO 33

General Expense

Dr.						Cr.			
Jan.	6	To Cash	21	64	June	30	By Sundries	252	52
April	8	" "	160	00					
"	8	" "	40	48					
"	8	" "	30	40					
			252	52				252	52

FOLIO 34

Loss and Gain

Dr.						Cr.			
June	30	To Sundries	252	52			By Balance	252	52
		Balance	252	52					

LEDGER—DOUBLE ENTRY

June 30, 19 —Balance Sheet—

Dr. FOLIO IN LEDGER		BALANCE AS PER LEDGER		Cr. FOLIO IN LEDGER		BALANCE AS PER LEDGER	
10	*Cash on Hand*	2,559	08	11	*Capital*	4,000	00
12	*Merchandise*	2,308	16	13	*E. J. White*	60	40
18	*Bills Receivable*	624	88	14	*Harry Short*	62	00
21	*A. Daniel*	61	60	15	*Mrs. Pearl Cook*	180	00
34	*Loss and Gain*	252	52	16	*Ralph Wilson*	46	60
				18	*Bills Payable*	1,194	80
				19	*M. Young*	187	04
				23	*W. Henderson*	75	40
		5,806	24			5,806	24

Explanation—Double-Entry Bookkeeping.

In the single-entry bookkeeping, it will be remembered, there is only one record, whereas in double-entry each item appears twice, once as *debit* and again as *credit;* also in the former, cash, stocks, goods, etc., did not appear as individual accounts, whereas in double-entry each of these is made an individual account. As it takes two parties to make a transaction, so in the *Ledger* it requires two entries, one for each party, to be made; for example, the *Journal* shows that *Merchandise* is debtor to four items, \$1631.00. Turning to the *Ledger*, folio 12, we will find \$1631.00 entered on the debtor side of the *Merchandise* account, and in folios 13-14-15 and 16, we shall find the four items entered under their respective accounts, which together exactly balance the \$1631.00; or, if the transaction be a cash transaction, and cash is paid out, as in the *Cash Book* on the credit side the item "E. J. White, \$160.00," this item appears on the debtor side of one account, folio 13, and on the credit side of *Cash* account, folio 10; under the sum total of "Disbursements." These two examples suffice to show how in double-entry bookkeeping every item must appear twice in the *Ledger*, once on the debtor side and once on the credit side; consequently, if every entry is made properly and accurately, the sum total of the entries on the debtor side of the *Ledger* must equal the sum total of the entries on the credit

side of the *Ledger*. The student should first carefully trace every item of the *Journal* and *Cash Book* to its proper place in the *Ledger*, afterwards write up a set of books for himself, copying, on properly ruled paper, the set as printed in this book, using the rulings indicated by the model script pages for each book, where the ruling has been accurately made. Afterwards, turning back, endeavor to write up the trial list of transactions into a set of double-entry accounts.

Journal.—We have reproduced a model page of the *Journal* which differs from the single-entry only in slight particulars. It is more properly a *Journal* than a *Day Book*, as it is used to indicate by the entries which side of the *Ledger* each item is to be posted, whereas the *Day Book* is a mere history of the daily transactions, without arranging the items with reference to their being posted to the *Ledger*. In journalizing the bookkeeper should have clearly in his mind which is the debit and which is the credit item, beginning his entry always and uniformly with the debit item; for instance, "Merchandise, Debtor to E. J. White." The word "debtor" is not expressed in the *Journal*, the debit item being to the left and the credit item to the right. Debit amount in the first column and credit amount in the second column.

Cash Book.—The *Cash Book* in double-entry is in all particulars the same in form as that of single-entry. (Compare the script pages.) It is to be remembered that the item entered in Cash on the debtor side appears on the credit side of the *Ledger* account to that particular item, and the second entry will be accounted for in the *Cash Account* of the *Ledger*. It is important in receiving cash to enter it at the time received in the *Cash Book*, on the debtor side, and under the name of the account to which it is to be posted in the *Ledger;* for instance, A. Daniel pays his account, $40.00. The cash entry is "A. Daniel, Payment on Account $40.00." It is customary in business to classify the receipts under one or two general accounts, and open in the *Ledger* only such accounts as are desired to keep a record of; hence such entries as "Cash for Sundry Sales" indicate that these will be accounted for in the *Ledger* in the *Cash Account*. Where there are two or three sources from which moneys are received, which are necessary to be posted, the *Cash* contains a separate dollar and cents ruling at the right for each; hence some Cash Books have as many as four or five rulings for dollars and cents, and at the top of each ruling is indicated the name of the account, as *Rents*, *Hardware*, *Groceries*, *etc.* And on the credit side the money paid out may be for such accounts as *Postage*, *Taxes*, *Freights*. At the end of each month these columns should be added and the totals posted to their respective accounts in the *Ledger*. This is a very convenient form, and easily understood.

Red ink should be sparingly used in bookkeeping, and when used it should be uniformly done. It is customary in the *Cash Book* to rule all horizontal lines in red, and on the credit side the word "Balance" and the amount opposite to it are written in red, but brought down on the debit side in black. Note the ruling in the *Cash Book*, in the model pages. It will be seen that the single horizontal line extends only across one column, the double horizontal line across two columns.

Ledger.—What has been said in the single-entry as to the arrangement of the accounts on the pages of the *Ledger* applies also to the double entry. The ruling also is, in the main, the same in both. It will be remembered that in the double-entry bookkeeping we have such accounts as *Cash*, *Capital Account*, *Merchandise*, *Bills Payable*, *and Bills Receivable*, which did not appear in the single-entry. The *Cash* account, folio 10, is debtor to the *Capital* account $4,000.00, and the *Capital* account is credited "By Cash $4,000.00." The *Cash* account is credited "By Disbursements" as indicated on the credit side of the *Cash Book*. It is debited again by the amount of cash on hand at the time of closing the books, giving a balance of $2,559.08, which is entered on the credit side, which closes the account, and appears again on the debit side when the account is again opened. *Merchandise*, folio 12, is debited "To Sundries," which means that there are several items, the total of which is $1631.00, or whatever the amount is written opposite the word, and it is credited "By" several individual accounts,

the folio number being entered in the column prepared for that purpose. Each of these items should be accounted for in some one of the other accounts.

In *Bills Payable* account on the debit side are posted the amounts of notes paid out and which are our obligations to pay. When paid each is entered on the debit side of Cash as Bills Payable and posted to credit side of Bills Payable account, thus balancing each note. The face amounts of the notes must always be posted in full on either side of the Bills Payable account, and any discount or interest will be charged or credited as the case may be to Interest and Discount Accounts.

Closing Books.—In closing the books at any given period we rule off all personal accounts and bring the balance down in red ink; if our debtor, the account will appear first on the credit side in red ink "*By Balance*" then transfer to the debit side "*To Balance*"; if our creditor, the reverse of the above operation. In closing loss and gain accounts and personal accounts uncollected (which become Loss and Gain accounts) we charge them to Loss and Gain account. But it should be understood that personal accounts are not in fact Loss and Gain accounts, as they could be charged to Merchandise account with the same result, as the profit from the sale of our goods would be lessened to the extent of our bad accounts, as "To Jones & Co. $72.40" is a note received from them, posted from the *Journal;* on the credit side "April 1, By Cash $72.40" is posted through *Cash* when the note was paid. Whenever notes are taken the parties giving them must be *credited* and the *Bills Receivable debited*. When notes are given the parties receiving them must be *debited* and the *Bills Payable credited*. When cash is paid out *Cash* must be *credited* and whatever is paid out must be *debited*.

In *Loss and Gain* account the credit side shows when there is a gain in business, and the debit side shows when there is a loss in business. The *Loss and Gain* account is the account where all bad debts must be charged by transferring them from the individual accounts, through the *Journal*, into the *Loss and Gain* account.

In order to see that our entries and postings have been right, the following method must be followed, which is called "balancing the books:"

Balancing Books.—Balance each individual account, strike a balance, which is done by entering the difference of the two sides of the account on the side requiring an addition to make it equal to the other side, draw two horizontal lines under the sum totals, which are placed on exactly the same line of the page, and bringing down on the opposite side "Balance" with its amount. This will be seen in looking at any of the accounts in the *Ledger*. After this has been done, take all those balances which appear on the debit side of your *Ledger* and add them together. Do the same on the credit side, and if the two sums are equal to each other your books are correct; however, to give positive proof, after the totals of both sides have agreed, see that they agree and are equal with those of the *Journal*. This will give you a double sure proof that your books are correct. The items standing on the debit side of your trial balance sheet should be *Cash in Hand*, *Accounts Receivable*, *Notes Receivable*, *Equipments* and *Stock Inventory*, and on the credit side should appear your *Liabilities*, *Notes Payable*, *Profit and Loss*, if you have made a gain in your business; otherwise *Profit and Loss* will stand on the debit side.

The balance sheet for the Single-entry will be found on previous page, which shows that there has been a loss of $252.52, which is the difference between the $4000.00 started with and the balance, $3747.45, with which we close business. This is a little over 6 per cent. loss. Had the balance been $4210.00 there would have been a profit of $210.00. On the balance sheet for the Double-entry it will appear that there has been a loss of $252.52, as entered in the *Loss and Gain* account.

VOCABULARY OF BUSINESS TERMS

Acceptance.—Agreeing to the terms proposed; the acceptor's name written on the face of a bill of exchange or draft, usually with the word "Accepted."

Accommodation Paper.—Notes or acceptances drawn for the purpose of being discounted, and not founded on an actual sale of goods.

Account Current.—A running account. A detailed statement of the transactions between two persons or firms.

Account Sales.—An itemized statement of sales and expenses, sent by a commission merchant to his principal.

Actuary.—A registrar; a clerk; a person skilled in the application of the doctrine of chances to financial affairs, more especially to insuring of lives.

Adjust.—To put in order; to bring to a satisfactory state, so that parties can agree.

Administrator.—One that is appointed by the court to settle an estate.

Affidavit.—A written declaration under oath.

Agent.—A party acting on behalf of another, called his principal; one commissioned to do business for another; a factor.

Annuity.—A periodical payment of money, amounting to a fixed yearly sum.

Arbitration.—The adjustment of a disputed point by a person or persons chosen by the parties in dispute.

Assessment.—A call upon the holders of stock or policies to pay into the treasury a certain sum in order to pay off debts or effect a re-organization.

Assets.—Funds, property, or effects; the stock in trade, cash, and all the available property of a merchant, in contradistinction to his liabilities or obligations.

Assignee.—A person to whom the property of a bankrupt or an insolvent debtor is transferred for the benefit of creditors.

Assignment.—The act of transferring property to the assignee,

Attachment.—A legal writ for the purpose of seizing a man's property.

Auditor.—An officer appointed to examine and verify claims upon the treasury of a company or society and to investigate the treasurer's accounts.

Balance of Trade.—The difference between the value of our commercial imports and exports.

Bankrupt.—One unable to pay his debts, and takes advantage of the bankrupt law.

Bear.—A person whose interest it is to secure lower prices.

Bill of Exchange.—An order for the payment of money, usually drawn on a person living in a foreign country, *draft* being used to designate bills that are payable in the same country in which they are drawn.

Bill of Lading.—A written account of goods shipped, and the conditions of shipment, having the signature of the carrier's agent, and given the shipper as a receipt.

Bill of Sale.—A writing given by the seller to the buyer, transferring the ownership of personal property.

Bond.—An instrument under seal, by which the maker binds himself, and usually his heirs, executors, and administrators, to do or not to do a specified act. A certificate of ownership of a specified portion of a capital debt due by a government, a city, a railroad, or other corporation, to individual holders, and usually bearing a fixed rate of interest.

Bonded Goods.—Those which are stored in a bonded warehouse, or in bonded cars, the owner having given bonds securing the payment of import duties or of internal revenues, upon their removal or their arrival in some inland city of entry, and before a specified time.

Bonus.—A premium given on a loan, or for any favor shown.

Broker.—An agent who effects sales or purchases, or who makes loans and contracts for another.

Bucket Shop.—A place where bets are made on quotations of prices established on legitimate exchanges and boards of trade. Pretended trading. Illegal in most States. Recently taxed by Revenue Law.

Bull.—A person whose interest it is to secure higher prices.

Bulling.—Raising the price of stocks, etc.

Call Loans.—Money loaned subject to the call or demand of lender. It must be

returned the day it is called for before the close of banking hours.

Capital.—The investment in business.

Cash Sales.—The sales made for ready money, in contradistinction to sales on which credit is given.

Certificate.—A written voucher attesting to some fact; as a certificate of deposit, a certificate of stock.

Certified Check.—One which has been certified or accepted by the bank on which it is drawn, making the bank responsible for its payment.

Charter.—A paper from government, defining the rights and privileges of corporations.

Chattel Mortgage.—A mortgage of personal property.

Clearing House.—A kind of banking exchange, established in some of the large cities for the convenience of daily settlements; the drafts and checks on each other are mutually exchanged without the individual presentation of each at the banks, and a balance struck, which balance only is paid in cash.

Collaterals.—Pledges of stocks, notes, chattels, for security of loans and other indebtedness.

Commercial Paper.—Bills of exchange, drafts, and notes given in course of trade.

Commission.—A percentage given for the sale or purchase of goods, or the transaction of other business.

Company.—A corporation. A term also used in a firm name to designate other partners, whose names are not given.

Consignee,—One to whom goods are sent.

Copartnership.—A joining of two or more persons into one firm for the purpose of carrying on any enterprise. It has the same meaning as a partnership.

Corner.—An artificial scarcity created by holding property off the market for the extortion of abnormally high prices.

Coupon.—An interest note or a certificate attached to a transferable bond, cut off from the bond and collected when due.

Creditor.—One giving credit; one whom we owe.

Custom-House.—A government place where imported goods are entered and duties collected.

Days of Grace.—Negotiable promissory notes or bills of exchange, payable at a certain time, are in most places entitled to three days' delay beyond the time expressed, which are called days of grace.

Debenture.—A writing acknowledging a debt; a writing signed by a public officer or corporation as evidence of debt.

Debenture Bonds.—Concentration of floating capitalization into convenient bonded form. Originally, notes in the form of bonds.

Deed.—A written contract under seal, usually transferring the ownership of real estate.

Defalcation.—Deduction or discount. Embezzlement of money by an officer having it in charge.

Default.—The failure to pay fixed charges or interest coupons. This is a serious thing for a corporation, and usually causes a heavy shrinkage in value.

Discount.—An amount deducted from the regular price or list.

Discount Rate,—The rate per cent. of interest charged by banks for the use of money loaned. It is always deducted from the principal when the loan is made.

Dishonor.—A failure to pay an obligation when due; a failure to accept a draft when presented for acceptance.

Dividend.—The proportion of the profits alloted to each stockholder in a company.

Executor.—One appointed to execute the will of another.

Exporting Countries.—Those producing a surplus of grain which finds a market in other countries where there is a deficiency. The principal ones are the United States, Russia, Argentina, Hungarv, India, Roumania, and Australia.

Extension.—An allowance of further time for the payment of a debt.

Falling Market.—A continuous decline in prices.

Favor.—A note, draft, or check is drawn in favor of the party to whom it is made payable; a letter.

Fee Simple.—The absolute ownership of real estate.

F. O. B.—Free on board or free of all shipping expenses.

Good Will.—The reputation and patronage belonging to an established business. The good will of a business is frequently the subject of purchase and sale.

Honor.—To accept or pay draft when due.

Hypothecating.—Putting up collaterals for loans.

Importing Countries. — The United Kingdom, Germany, France, Italy, Belgium, Holland, Spain, Brazil, the West Indies, China, and Japan, because they produce less grain than is required for home consumption.

Insolvency.—Inability to pay debts or meet commercial obligations.

Insolvent.—Unable to pay one's debts; one who is insolvent.

Inventory.—A schedule or list of the goods, wares and merchandise generally, credits and assets of a merchant.

Invoice.—An itemized bill of merchandise bought, sold or shipped.

Jobber.—A wholesale merchant who buys goods from the importers and manufacturers, and sells to retailers.

Judgment.—The decree of a court enforcing a contract or redressing a wrong.

Liabilities.—The pecuniary obligations of a merchant, which include bills payable and all other debts.

Margin.—Money or collaterals deposited with a broker to protect contracts.

Mortgage.—The written pledge of real estate or chattels to secure payment.

Negotiable.—A term applying to commercial paper, that may be transferred by indorsement or simply by delivery.

Net Proceeds.—The proceeds of a sale after all expenses are deducted.

On Call.—Money loaned "on call" must be returned the day it is called for, before the close of banking hours, and without previous notice.

Open Account.—An unsettled account.

Option.—Property bought or sold at the call or demand of the buyer or seller, as may be specified; a conditional contract.

Outlawed.—Term applied to a debt or note which has run beyond the time when payment can be enforced by law.

Outstanding.—Unsettled; unpaid.

Overdrawn.—To draw a greater sum than one has to his credit.

Par Value.—Nominal value; usually the printed or written value of any paper.

Power of Attorney.—A written instrument giving an agent authority to act for his principal. An agent thus empowered is called an Attorney in Fact.

Protest.—A formal declaration made by a notary public of the non-payment, non-acceptance of a note or a draft.

Receiver.—A person appointed to take charge of the affairs of a corporation on its dissolution, and to distribute its property according to law.

Resources.—Money, property, or that which can be converted into property.

Renewal of a Note.—Extending the time of its payment by giving a new Note in exchange for it.

Sinking Fund.—A sum of money set apart for the redemption of the debts of a corporation or government.

Solvent.—Able to pay one's liabilities.

Spot Cash.—A term applied to a sale of goods to be paid for on delivery, *i. e.*, C. O. D.

Stock.—Certificates issued by a corporation certifying that the person in whose name they are written and stand registered on the corporation books is entitled to share in the company's profits, to vote, etc.

Syndicate.—A number of capitalists who unite together to dispose of a large loan, or to conduct some great financial enterprise.

Trade Discount.—A discount from certain list-prices, or from the amount of purchases, made to a dealer on account of a change in the prices, or for cash payments.

Trust.—A combination of manufacturers or dealers for the purpose of limiting production and advancing prices for their own benefit.

Valid.—A term applied to a contract that is properly executed; that is, legal or binding.

Void.—Having no legal or binding force.

Watered Stock.—An increase in capitalization without a corresponding increase in assets.

Without Recourse.—Not liable as an indorser if written over an indorser's signature on the back of commercial paper.

Warranty.—An agreement to become responsible, if certain facts do not turn out to be as represented.

RAPID CALCULATIONS

SHORT CUTS TO RESULTS—TIME-SAVING PROCESSES—
INTEREST TABLES AND WAGES CALCULATIONS—
HOW TO HANDLE FRACTIONS

QUICKNESS IN FIGURES

Book-keepers, bank clerks and others who have constant calculations to make need to be both expert and rapid. There are many short cuts practiced which every person should know, and a few of the most important are here explained.

Adding Quickly.

The art of adding quickly is acquired by learning to *read* a column of figures as you would a sentence of words, and those words composed of letters.

By *Practice* we may become so familiar with figures that when we see a group of them, we can tell at a glance what the sum of them reads, without spelling the figures at all. In practicing the reading of a column of figures in this way, we do not let the brain work at all, but simply pass the eye over the figures slowly at first, but increase the speed as proficiency is acquired.

A few minutes' daily practice will produce astonishing results in a very short time; beginning with two figures, then three, four, and so on until finally we become able to write the *Sum* total of long columns. For example, when we see the figures 9, 8, 6, 4, we know at a glance that the sum is 27 without reading the figures themselves or spelling them out.

Reading a column of figures is done by dividing a large group of figures into smaller ones and from group to group through the column, just as from word to word we read through a sentence.

The most important qualities of an accountant are accuracy and speed. The most speedy calculators are usually the most correct.

No labor should be regarded too great to master this, the key to all numerical as well as business transactions.

2. To multiply by numbers ending or beginning with 1; as 21, or 31, or 13, or 17, or 51, or 501, or 103, or any number of two figures where one of them is 1, or of three figures where two of them are 0 and 1, a good deal of time can be saved by abbreviating the ordinary process, as below:

RULE I. *When the 1 stands at the right*, multiply by the figure at its left, and place the product under the place of *tens* under the number to be multiplied. Add the two together, and their sum is the product.

If the multiplier is 201, or 301, or 401, or any number of hundreds, place the product two places to the left. *If the multiplier is* 2001, or any number of thousands, place the product three places to the left. In other words, the product of hundreds under hundreds' place; of thousands under thousands' place, etc.

RULE II. *When the 1 stands at the left of the multiplier*, multiply by the number at the right, and place the product under the multiplicand one place to the right of the

units' place. The second figure of the product under units' place of the multiplicand.

EXAMPLES. 231423×21=4859883.

231423=231423×1
4628460=231423×20

4859883=product.

20213 ×13	20213×201
60639	40426
262769=product.	4062813=product.

EXAMPLES FOR PRACTICE. 2134×11; 6215×11; 2143×11; 3212×11; 4215×11; 2153×21; 1024×31; 8461×41; 2222×14; 3120×19; 2132×201; 2146×102; 9842×301; 8002×402; 4621×105.

3. Short Cuts in General Multiplication.

EXAMPLE 1. Multiply 96 by 97.

96 . . . 4 (Complement.)
97 . . . 3 (Complement.)

9312

The *complement* of a number is the difference between the number and the unit of the next higher order, thus the complement of 96 is 4 (100-96); of 97 is 3; of 987 is 13, etc. To multiply these two numbers, multiply the complements 4 and 3, and place the product, 12, in the answer. For the remaining two figures subtract across, either the 4 from the 97, leaving 93, or the 3 from the 96, leaving 93. Apply this rule to the first and second lines of exercises below.

EXAMPLE 2. Multiply 37 by 43.

The mean number—that is, the number which s as much greater than 37 as it is less than 43—is 40. Forty squared, or multiplied by itself, gives 1600. The square of 3, the difference between the mean number and one of the numbers is 9. 1600—9=1591=the product of 37 and 43. Apply this rule to the exercises below.

EXAMPLE 3. Multiply 76 by 46.

46 6×6=36, carry 3.
76 6× (7+4)=6×11=66, and 3 carry 69.
3496 4×7=28, and 6 to carry, 34.

Multiply units by units for the first figure of the product, the sum of the tens by units for the second figure, and tens by tens for the third figure, carrying when necessary. A similar rule applies to numbers having the left-hand figures the same. Work the following exercises.

EXERCISES. 97×98; 95×94; 97×96; 95×93; 93×97; 97×94; 99×89; 994×995; 993×994; 989×998; 992×995; 988×997; 976×999; 954×998; 87×73; 63×57; 42×38; 45×35; 116×124; 1012×988; 1025×975; 56×56; 72×32; 87×37; 61×63; 114×114; 137×177; 125×112.

4. Short Cuts in Multiplication and Division by Special Numbers.

To multiply any number by 25, add two ciphers, and divide the number by 4.

To multiply any number by 125, add three ciphers, and divide the number by 8.

To multiply a number by any number of *nines*, add as many ciphers to the number as there are *nines*, and from this subtract the original number.

5. Short Multiplication and Division in Fractional Numbers.

To multiply any number by 2½, add one cipher, and divide by 4.

To multiply any number by 3⅓, add one cipher, and divide by 3.

To multiply by 33⅓, add two ciphers and divide by 3.

To multiply any number by $1\frac{3}{7}$, add one cipher, and divide by 7.

To multiply by 16⅔, add two ciphers, and divide by 6.

To multiply by $14\frac{2}{7}$, add two ciphers, and divide by 7.

To multiply by 875, add three ciphers, multiply by 7 and divide by 8.

To divide by 25, multiply by 4, and cut off two figures.

To divide by 125, multiply by 8, and cut off three figures.

To multiply by 12½, add two ciphers, and divide by 8.

To divide by 12½, multiply by 8, and cut off two figures at the right.

To divide by 33⅓ multiply by 3, and cut off two figures at the right.

Practical Applications.—To find the value of any number of articles at 75 cents each, say 248 yards of cloth at 75 cents a yard, deduct one-quarter of 248 from it, and call the remainder dollars. At a dollar a yard the result will be $248; then at 75 cents it must be $248—(¼ of 248)=$186.

Find the cost of 84 yards of cloth at 12½ cents a yard.

What will 328 bags of potatoes cost at 75 cents a bag?

Find the cost of 20 gross of pen-handles at 25 cents each.

What will 216 pounds or raisins cost at $16\frac{2}{3}$ cents a pound?

A railway charges a cent a mile, for the first 50 miles, for carrying a cord of wood, and then 3 cents for every 4 miles beyond the 50; what will it cost to carry 250 cords 90 miles?

If a clerk receives $640 a year, and his expenses are $325 a year, how many years will it take him to pay for a 56-acre farm at $45 an acre?

A fruit dealer bought 5 bushels of cherries at $2.50 a bushel, and sold them at 15 cents a quart; did he gain or lose, and how much?

6. Other Short Fractional Multiplication.

To multiply any number containing $\frac{1}{2}$, such as $7\frac{1}{2}$, $19\frac{1}{2}$, $12\frac{1}{2}$, etc., by itself, multiply the whole number by the next higher whole number, and annex $\frac{1}{4}$ to the product. Thus, $7\frac{1}{2} \times 7\frac{1}{2} = 7 \times 8 + \frac{1}{4} = 56\frac{1}{4}$; and $19\frac{1}{2} \times 19\frac{1}{2} = 19 \times 20 + \frac{1}{4} = 380\frac{1}{4}$. Apply this rule to the first column of exercises below.

To multiply two fractional numbers, such as $7\frac{1}{4}$ and $7\frac{3}{4}$, multiply 7 by 8, and add to the product the product of $\frac{3}{4}$ and $\frac{1}{4}$, or $\frac{3}{16}$, and you have the correct product. Apply this rule to the second column of exercises below.

To multiply two fractional numbers, each containing $\frac{1}{2}$, such as $5\frac{1}{2}$ by $7\frac{1}{2}$, add the product of the whole numbers, plus $\frac{1}{4}$ to $\frac{1}{2}$ of the sum of the whole numbers. Thus, $5 \times 7 = 35$; $35 + \frac{1}{2}(5+7) = 35 + 6 = 41$, and to this add $\frac{1}{4}$, making $41\frac{1}{4}$, the product. Apply this rule to the third column of exercises below.

To multiply two fractional numbers each containing $\frac{3}{4}$, such as $11\frac{3}{4}$ by $13\frac{3}{4}$; to the product of the whole numbers add the product of their sum by $\frac{3}{4}$, after which add the product of $\frac{3}{4}$ by $\frac{3}{4}$. This rule applies in all cases where both fractions are the same. Apply it in working the fourth column of exercises below.

EXAMPLES FOR PRACTICE.

$6\frac{1}{2} \times 6\frac{1}{2}$	$5\frac{1}{4} \times 5\frac{3}{4}$	$2\frac{1}{2} \times 5\frac{1}{2}$	$2\frac{3}{4} \times 4\frac{3}{4}$
$4\frac{1}{2} \times 4\frac{1}{2}$	$8\frac{1}{4} \times 8\frac{3}{4}$	$4\frac{1}{2} \times 6\frac{1}{2}$	$3\frac{1}{4} \times 3\frac{1}{4}$
$5\frac{1}{2} \times 5\frac{1}{2}$	$9\frac{1}{3} \times 9\frac{2}{3}$	$2\frac{1}{2} \times 8\frac{1}{2}$	$8\frac{3}{4} \times 2\frac{3}{4}$
$8\frac{1}{2} \times 8\frac{1}{2}$	$6\frac{4}{5} \times 6\frac{1}{5}$	$9\frac{1}{2} \times 8\frac{1}{2}$	$8\frac{3}{5} \times 4\frac{3}{5}$
$12\frac{1}{2} \times 12\frac{1}{2}$	$2\frac{2}{5} \times 2\frac{3}{5}$	$2\frac{1}{2} \times 7\frac{1}{2}$	$9\frac{1}{4} \times 4\frac{1}{4}$
$19\frac{1}{2} \times 19\frac{1}{2}$	$9\frac{1}{6} \times 9\frac{5}{6}$	$1\frac{1}{2} \times 9\frac{1}{2}$	$8\frac{1}{3} \times 2\frac{1}{3}$

7. To Multiply Numbers Ending in 5.

To multiply two small numbers each of which ends in 5, such as 35 and 75, take the product of the 3 and 7, increase this by one-half of the sum of these figures, and prefix the result to 25. Thus,

$$\begin{array}{ll} 35 & 5 \times 5 = 25 \\ \underline{75} & 7 \times 3 = 21,\ 21 + \frac{1}{2}(7+3) = 26 \\ 2625 & \end{array}$$

This rule will be found to hold good with any two numbers each of which end with 5. Apply it to the examples below:

EXAMPLES FOR PRACTICE. 45×85; 95×25; 35×65; 75×95; 85×55.

8. To Multiply Special Large Numbers.

In the multiplication of large numbers, where one part of the multiplier is a *multiple* of the remainder, the work can always be considerably abbreviated. See the examples below:

$$\begin{array}{rl} 2043 & \\ \underline{427} & = 420 + 7 = (7 \times 60) + 7 \\ 14301 & = 2043 \times 7 \\ \underline{858060} & = 2043 \times 420 = 14301 \times 60 \\ 872361 & = \text{product.} \end{array}$$

$$\begin{array}{rl} 3142 & \\ \underline{972} & = 900 + 72 = 900 + (9 \times 8) \\ 2827800 & = 3142 \times 900 \\ \underline{226224} & = 3142 \times 72 = 28278 \times 8 \\ 3054024 & = \text{product.} \end{array}$$

We first multiply by 7, then by 420, thus taking the number 2043, 427 times. The contraction is made in multiplying by 420. We take its factors, 7 and 60; we have already multiplied by 7, so that all that remains to be done is to multiply 14301 by 60 and place it under. The sum of the two partial products gives the whole product. As a test exercise, multiply some number by 14412 so as to have only two lines instead of five to add. See exercises in second and third columns below:

Remember, that any number is *divisible by 3* if the sum of its digits is divisible by 3; that any number is *divisible by 5* if its right-hand figure is 5 or 0; that any number is *divisible by 9* if the sum of its digits is divisible by 9.

EXERCISES.—2013×927; 1214×279; 3135×728; 2146×287; 3210×189; 21401×729; 31252×14412; 42001×70357; 15421×81273; 30012×94572.

Lightning Table for Marking Goods Bought by the Dozen.

Retailers buy most of their articles by the *dozen*, such as boots, shoes, hats, caps, and notions

of various kinds. A vast amount of time is employed in marking goods by the old process, and errors are frequent, owing to the unnecessary figures used. If the purchaser will commit to memory the following table, he can instantly find the retail price of a single article with any desired business per cent. added. The following per cents. are those generally used in business:

To make		Divide the cost per doz. by		
20	per cent.	10		
33⅓	"	9		
50	"	8		
100	"	6		
40	"	10, and add	1-6	itself.
35	"	10 "	1-8	"
37½	"	10 "	1-7	"
30	"	10 "	1-12	"
25	"	10 "	1-24	"
12½	"	10 and subtract	1-16	"
16⅔	"	10 "	1-36	"
18¾	"	10 "	1-96	"

S. T. Jones purchased one dozen hats for $27.00, and marked them to sell at a profit of 33⅓ per cent. What was the retail price of a single hat?

Explanation.—According to table, simply divide the cost per dozen by 9. 9) $27.00

Ans. $3.00

For how much must I sell books bought at $28.00 per dozen, to gain 25 per cent?

Explanation.—Removing the point one place to the left, on $28.00 we get $2.800. Now add 1-24 itself and we have $2.91 = ans.

24) 2.800
.11
$2.91+

The above table should be committed to memory.

Board Bills, Day or Week.

The following tables will also answer for calculating the amount of wages by the week or month of hired girls, servants, etc., who are compelled to labor on the Sabbath; being calculated for seven days in the week instead of six.

Multiply these tables by 4, and you have wages by the month:

At $2.00 a wk.			At $2.25 a wk.			At $2.50 a wk.			At $3.00 a wk.		
Dys.	$	Cts.	Dys.	$	Cts.	Dys.	$	Cts.	Dys.	$	Cts.
1		28½	1		32	1		35¾	1		43
2		57	2		64¼	2		71½	2		85¾
3		85¾	3		96¼	3	1	01¼	3	1	28¾
4	1	14¼	4	1	28½	4	1	43	4	1	71½
5	1	42¾	5	1	60½	5	1	78¾	5	2	14¼
6	1	71¼	6	1	92¾	6	2	14¼	6	2	57
7	2	00	7	2	25	7	2	50	7	3	00

NOTE.—To find the daily rate at $4 per week, double the $2 rate; at $4.50, double the $2.25 rate, etc., etc. This table thus suffices for all the usual rates of board from $2 to $15 per week.

Wages per Hour Under a Daily Contract.

At 50 cts. a day. Showing the rate of wages per hour, for 12 hours a day.			At 75 cts. a day. Showing the rate of wages per hour, for 12 hours a day.			At $1.25 a day. Showing the rate of wages per hour, for 12 hours a day.			At $1.75 a day. Showing the rate of wages per hour, for 12 hours a day.		
Hrs.	$	Cts.	Hrs.	$	Cts.	Hrs.	$	Cts.	Hrs.	$	Cts.
1		4¼	1		6¼	1		10½	1		14½
2		8½	2		12½	2		21	2		29
3		12½	3		18¾	3		31¼	3		43¾
4		16¾	4		25	4		41¾	4		58¼
5		21	5		31¼	5		52¼	5		72¾
6		25	6		37½	6		62½	6		87½
7		29½	7		43¾	7		73	7	1	02
8		33½	8		50	8		83½	8	1	16½
9		37½	9		56¼	9		93¾	9	1	31¼
10		41¾	10		62½	10	1	04¼	10	1	45¾
11		46	11		68¾	11	1	14¾	11	1	60¼
12		50	12		75	12	1	25	12	1	75

NOTE.—To find hourly rate at $1 per day, double the 50c. rate; at $1.50 per day, double the 75c. rate; at $2 per day, multiply 50c. rate by 4; at $2.50 per day, double the $1.25 rate; at $3 per day, multiply 75c. rate by 4; at $3.50 per day, double the $1.75 rate, etc.

Daily Rate of Wages Under a Weekly Contract.

At 62½ cts per day, or $3.75 per week.			At $1.00 per day, or $6,00 per week.			At $1.25 per day, or $7.50 per week.			At $1.50 per day, or $9.00 per week.		
Dys.	$	Cts.	Dys.	$	Cts.	Dys.	$	Cts.	Dys.	$	Cts.
¼		15½	¼		25	¼		31¼	¼		37½
½		31¼	½		50	½		62½	½		75
¾		47	¾		75	¾		93¾	¾	1	12½
1		62½	1	1	00	1	1	25	1	1	50
1¼		78	1¼	1	25	1¼	1	56¼	1¼	1	87½
1½		93¾	1½	1	50	1½	1	87½	1½	2	25
1¾	1	09¾	1¾	1	75	1¾	2	18¾	1¾	2	62½
2	1	25	2	2	00	2	2	50	2	3	00
2¼	1	40½	2¼	2	25	2¼	2	81¼	2¼	3	37½
2½	1	56¼	2½	2	50	2½	3	12½	2½	3	75
2¾	1	72	2¾	2	75	2¾	3	43¾	2⅔	4	12½
3	1	87½	3	3	00	3	3	75	3	4	50
3¼	2	03¼	3¼	3	25	3¼	4	06¼	3¼	4	87½
3½	2	18¾	3½	3	50	3½	4	37½	3½	5	25
3¾	2	34½	3¾	3	75	3¾	4	68¾	3¾	5	62½
4	2	50	4	4	00	4	5	00	4	6	00
4¼	2	65¾	4¼	4	25	4¼	5	31¼	4¼	6	37½
4½	2	81¼	4½	4	50	4½	5	62½	4½	6	75
4¾	2	97	4¾	4	75	4¾	5	93¾	4¾	7	12½
5	3	12½	5	5	00	5	6	25	5	7	50
5¼	3	28¼	5¼	5	25	5¼	6	56¼	5¼	7	87½
5½	3	43¾	5½	5	50	5½	6	87½	5½	8	25
5¾	3	59½	5¾	5	75	5¾	7	18¾	5¾	8	62½
6	3	75	6	6	00	6	7	50	6	9	00

Rapid Method for Counting Interest.

The method of reckoning interest generally used by the best accountants and bookkeepers is what is known as the sixty-day method. By this method 360 days are reconed as a year and 30 days as a month. Six

per cent. for 12 months, or 1 year, is equivalent to 1 per cent. for 2 months, or 60 days, and 1 per cent. of any number is easily found by moving the decimal point two places to the left. Therefore, the interest on any amount at 6 per cent. per annum for 2 months, or 60 days, may be found by moving the decimal point two places to the left. Having found the interest for 60 days, in order to find it from that amount for any number of days, simply divide them into aliquot parts of 60.

EXAMPLE 1: Interest on $128 for 90 days.

1.28 = interest for 60 days.
.64 = interest for 30 days.

1.92 = interest for 90 days. 60+30.

EXAMPLE 2: Interest on $185.40 for 47 days.

1.8540 = interest for 60 days.

.9270 = interest for 30 days, ½ of 60.
.4635 = interest for 15 days, ½ of 30.
.0618 = interest for 2 days, $\frac{1}{15}$ of 30.

1.4523 = interest for 47 days. 30+15+2.

Interest Table.

The interest on any sum of money may readily be found by means of the following table showing the interest on $1 at various rates and times:

	5%	6%	7%	8%		5%	6%	7%	8%
Yr.					Yr.				
1	.05	.06	.07	.08	4	.20	.24	.28	.32
2	.10	.12	.14	.16	5	.25	.30	.35	.40
3	.15	.18	.21	.24	6	.30	.36	.42	.48
Mo.					Mo.				
1	.00416	.005	.00583	.00666	7	.02916	.035	.04083	.04666
2	.00833	.01	.01166	.01333	8	.03333	.04	.04666	.05333
3	.01250	.015	.01750	.02000	9	.03750	.045	.05250	.06000
4	.01666	.02	.02333	.02666	10	.04166	.05	.05833	.06666
5	.02083	.025	.02916	.03333	11	.04583	.055	.06416	.07333
6	.02500	.03	.03500	.04000					
Da.					Da.				
1	.00013	.00016	.00019	.00022	16	.00222	.00266	.00311	.00355
2	.00027	.00033	.00038	.00044	17	.00236	.00283	.00330	.00377
3	.00041	.00050	.00058	.00066	18	.00250	.00300	.00350	.00400
4	.00055	.00066	.00077	.00088	19	.00263	.00316	.00369	.00422
5	.00069	.00083	.00097	.00111	20	.00277	.00333	.00388	.00444
6	.00083	.00100	.00116	.00133	21	.00291	.00350	.00408	.00466
7	.00097	.00116	.00136	.00155	22	.00305	.00366	.00427	.00488
8	.00111	.00133	.00155	.00177	23	.00319	.00383	.00447	.00511
9	.00125	.00150	.00175	.00200	24	.00333	.00400	.00466	.00533
10	.00138	.00166	.00194	.00222	25	.00347	.00416	.00486	.00555
11	.00152	.00183	.00213	.00244	26	.00361	.00433	.00505	.00577
12	.00166	.00200	.00233	.00266	27	.00375	.00450	.00525	.00600
13	.00180	.00216	.00252	.00288	28	.00388	.00466	.00544	.00622
14	.00194	.00233	.00272	.00311	29	.00402	.00483	.00563	.00644
15	.00208	.00250	.00291	.00333					

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Find interest for $1 in this table at given per cent. for given number of years, months and days and multiply by the given amount.

Table Showing How Many Days a Note Has to Run.

The following table will be found very useful to book-keepers in calculating the number of days a note has to run:

FROM	TO Jan	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
January	365	31	59	90	120	151	181	212	243	273	304	334
February	334	365	28	59	89	120	150	181	212	242	273	306
March	306	337	365	31	61	92	122	153	184	214	245	275
April	275	306	334	365	30	61	91	122	153	183	214	244
May	245	276	304	335	365	31	61	92	123	153	184	214
June	214	245	273	304	334	365	30	61	92	122	153	183
July	184	215	243	274	304	335	365	31	62	93	123	153
August	153	184	212	243	273	304	334	365	81	61	92	122
September	122	153	181	212	242	272	303	334	365	30	61	91
October	92	123	151	182	212	243	273	304	335	365	31	61
November	61	92	120	151	181	212	242	273	304	334	365	30
December	31	62	90	121	151	182	212	243	274	304	335	365

The table gives the number of days intervening between any day in any month to a similar date in any other montn. To ascertain these intervening days, run the eye along the line designated by title of the month on the left hand, until it reaches its intersection by the column headed at the top, by the month in which the note matures, and the figures at the angle denote the number of days from the first of the respective months. To this add the day upon which the note matures, and from the sum subtract the date of the month from which it is reckoned.

EXAMPLE.—A note falling due June 26th is offered for discount on March 10th; wanted, the number of days intervening before maturity.

The figures at the angle give . . 92
Add date of note's maturity . . 26

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Deduct date of discount . . 10

Days to run 108

EVERY-DAY LAW

ITS REQUIREMENTS AND PENALTIES—CRIMINAL LAW—LAWS GOVERNING BUSINESS TRANSACTIONS—THE MAKING OF NOTES—DRAWING LEASES, LANDLORDS AND TENANTS—CONTRACTS OF ALL KINDS—PARTNERSHIPS—CORPORATIONS—POWERS OF AGENTS AND ATTORNEYS—INSURANCE

IMPORTANT USAGES AND PRACTICES

Points of Criminal Law.

Law should be, and is intended to constitute, a rule of right governing the actions of man in his dealings with his fellow-beings.

You cannot lawfully condone an offense by receiving back stolen property.

The exemption of females from arrest applies only in civil, not in criminal matters.

Every man is bound to obey the call of a Sheriff for assistance in making an arrest.

The rule "Every man's house is his castle" does not hold good when a man is accused of crime.

Embezzlement can be charged only against a clerk or a servant, or the officer or agent of a corporation.

Bigamy cannot be proven in law if one party to a marriage has been absent and not heard from for five years.

Grand larceny is when the value of property stolen exceeds $25.00—when less than that, the offense is petit larceny.

Arson to be in the first degree must have been committed at night, and the buildings fired must have been inhabited.

Drunkenness is not a legal excuse for crime, but delirium tremens is considered by the law as a species of insanity.

In a case of assault it is only necessary to prove an "offer or attempt at assault." Battery presumes physical violence.

Mayhem, although popularly supposed to refer to injury to the face, lip, tongue, eye, or ear, applies to any injury done a limb.

A felony is a crime punishable by imprisonment in a State prison; an "infamous" crime is one punishable with death or State prison.

A police officer is not authorized to make an arrest without a warrant unless he has personal knowledge of the offense for which the arrest is made.

An accident is not a crime, unless criminal carelessness can be proven. A man shooting at a burglar and killing a member of his family is not a murderer.

Burglary in the first degree can be committed only in the night time. Twilight, if dark enough to prevent distinguishing a man's face, is the same as "night" in law.

Murder to be in the first degree must be wilful, premeditated, and malicious, or committed while the murderer is engaged in a felonious act. The killing of a man in a duel is murder, and it is a misdemeanor to accept or give a challenge.

False swearing is perjury in law only when willfully done, and when the oath has

been legally administered. Such qualifying expressions as "to the best of my belief," "as I am informed," may save an averment from being perjured. The law is that the false statement sworn to must be absolute. Subornation of perjury—that is, inducing another to swear falsely, is a felony.

The penalties which follow the violation of any of the points of criminal law vary slightly in various places, but all include fines or imprisonment, or both. The penalties are intended to be sufficiently severe to deter those evilly disposed from disturbing the peace and happiness of the community.

Important Points of Business Law.

The law compels no one to do impossibilities.

An agreement without consideration is not valid.

Ignorance of the law does not excuse an offender, but it does often influence the mercy of the Court in fixing penalty.

He who conceals a fraud is himself a defrauder.

Signatures made with a lead pencil are good in law.

A receipt for money paid is not legally conclusive.

The act of one partner binds all the others.

The seal of a party to a written contract imports consideration.

A contract made with a minor cannot be enforced against him. A note made by a minor is voidable.

A contract made with a lunatic is void.

A contract made on a Sunday is void.

Principals are liable for the acts of their agents.

Agents are liable to their principals for errors.

Each individual in a partnership is liable for the whole amount of the debts of the firm.

A note which does not state on its face that it bears interest, will bear interest only after maturity.

A lease of land for a longer term than one year is void unless in writing.

An indorser of a note is exempt from liability if notice of its dishonor is not mailed or served within twenty-four hours of its non-payment.

In case of the death of the principal maker of a note, the holder is not required to notify a surety that the note is not paid, before the settlement of the maker's estate.

Notes obtained by fraud, or made by an intoxicated person, are not collectible.

If no time of payment is specified in a note, it is payable on demand.

An indorser can avoid liability by writing "without recourse" beneath his signature.

A check indorsed by the payee is evidence of payment in the drawer's hands.

An outlawed debt is revived should the debtor make a partial payment.

Want of consideration—a common defense interposed to the payment of negotiable paper—is a good defense between the original parties to the paper; but after it has been transferred before maturity to an innocent holder for value it is not a defense.

Negotiable paper, payable to bearer or indorsed in blank, which has been stolen or lost, cannot be collected by the thief or finder, but a holder who receives it in good faith before maturity, for value, can hold it against the owner's claims at the time lost.

Sometimes the holder of a paper has the right to demand payment before maturity; for instance, when a draft has been protested for non-acceptance and the proper notices served, the holder may at once proceed against the drawer and indorsers.

If a note or draft is to be paid in the State where it is made, the contract will be governed by the laws of that State. When negotiable paper is payable in a State other than that in which it is made, the laws of that State will govern it. Marriage contracts, if valid where they are made, are valid everywhere. Contracts relating to personal property are governed by the laws of the place where made, except those relating to real estate, which are governed by the laws of the place where the land is situated.

If a negotiable paper, pledged to a bank as security for the payment of a loan or debt, falls due, and the bank fails to demand payment and to have it protested when dishonored, the bank is liable to the owner for the full amount of the paper.

The expression "Value received" should be written in a note, but it is not necessary. If not written, it is presumed by law, or may be supplied by proof.

No consideration is sufficient in law if it be illegal in its nature. Checks or drafts must be presented for payment without unreasonable delay. Checks or drafts should be presented during business hours; but in this country, except in the case of banks, the time extends through the day and evening.

If the drawer of a check or draft has changed his residence, the holder must use due or reasonable diligence to find him.

If one who holds a check, as payee or otherwise, transfers it to another, he has a right to insist that the check be presented that day, or, at farthest, on the day following.

A note indorsed in blank (the name of the indorser only written) is transferable by delivery, the same as if made payable to bearer.

The maker of an "accommodation" bill or note (one for which he has received no consideration, having lent his name or credit for the accommodation of the holder) is not bound to the person accommodated, but is bound to all other parties, precisely as if there was a good consideration.

An indorsee has a right of action against all whose names were on the bill, when he received it.

A bill, note or draft may be written upon any kind of paper, either with ink or pencil.

An indorsement may be written on the face or back.

An indorser may prevent his own liability to be sued by writing "without recourse," or similar words.

The holder of a note may give notice of protest either to all previous indorsers or only to one of them; in case of the latter he must select the last indorser, and the last must give notice to the last before him, and so on. Each indorser must send notice the same day or the day following. Neither Sunday nor any legal holiday is counted in reckoning time in which notice is to be given.

If the letter containing a protest of non-payment be put into the post-office, any miscarriage does not affect the party giving notice. Notice of protest may be sent either to the place of business or of residence of the party notified.

After the death of a holder of a bill or note, his executor or administrator may transfer it by his indorsement.

The husband who acquires a right to a draft or note which was given to the wife, either before or after marriage, may indorse it.

Written instruments are to be construed and interpreted by law according to the simple, customary and natural meaning of the words used.

The finder of negotiable paper, as of all other property, must make reasonable efforts to find the owner, before he is entitled to appropriate it for his own purposes. If the finder conceal it, he is liable to the charge of larceny or theft.

Joint payees of a bill of exchange, draft or note, who are not partners, must all join in an indorsement.

An oral agreement must be proved by evidence. A written agreement proves itself. The law prefers written to oral evidence, because of its precision.

No evidence can be introduced to contradict or vary a written contract; but it may be received in order to explain it, when such explanation is needed.

Contracts and Agreements.

A contract or agreement is where a promise is made on one side and assented to on the other, or where two or more persons enter into engagement with each other by a promise on either side. In a written contract assent is proved by the signature or mark. In verbal agreements it may be given by a word or a nod, by shaking hands, or by a sign. The old adage, "Silence gives consent," is often upheld in law.

Persons under age are incompetent to make contracts except under certain limitations. Generally minors are incapable of making binding contracts.

There are several causes which void contracts, first among which is *fraud*. No fraudulent contract is binding in law or in equity; but the party defrauded must void the contract as soon as he discovers the

fraud. If he continues under the contract after the fraud is discovered he cannot afterwards void it.

Some Important Contract Don'ts.

DON'T enter into an agreement on Sunday unless it is ratified on a week-day.

DON'T make a contract with a person of unsound mind or under the influence of liquor, or otherwise under restraint of liberty, mind or body. Use caution in making contracts with an illiterate, blind or deaf and dumb person, and see to it that witnesses are present.

DON'T put a forced construction on a contract —the intent of the parties is a contract.

DON'T suppose that you can withdraw a proposition made in writing and sent by mail after the party to whom it was made has mailed an unconditional acceptance.

DON'T suppose that a conditional acceptance of a proposition is binding on the party making the proposition.

DON'T forget that the courts will construe a contract according to the law prevailing where it was made.

DON'T forget that the law says, "no consideration, no contract," and that the courts will not enforce a contract that is too severe in its provisions.

DON'T sign an agreement unless you have carefully weighed its provisions, which should be all fixed and certain.

Copartnerships.

Partnerships may be either general or special. In general partnerships money invested ceases to be individual property. Each member is made personally liable for the whole amount of debts incurred by the company. The company is liable for all contracts or obligations made by individual members.

Special partners are not liable beyond the amount contributed.

A person may become a partner by allowing people generally to presume that he is one, as, by having his name on the sign or parcel or in the bills used in the business.

A share or specific interest in the profits or loss of a business, as remuneration for labor may involve one in the liability of a partner.

In case of bankruptcy, the joint estate is first applied to the payment of partnership debts, the surplus only going to the creditors of the individual estate.

A dissolution of partnership may take place under express stipulations in the articles of agreement, by mutual consent, by the death or insanity of one of the firm, by award of arbitrators, or by court of equity in cases of misconduct of some member of the firm.

Interest Laws and Statutes of Limitations.

States and Territories.	Interest Rate.		Statutes of Limitations.		
	Legal Rate.	Rate Allowed by Contract.	Judgments, Years.	Notes, Years.	Open Accounts, Years.
	per ct.	per ct.			
Alabama	8	8	20	6	3
Arkansas	6	10	10	5	3
Arizona.	7	Any rate.	5	5	3
California	7	Any rate.	5	4	2
Colorado	8	Any rate.	10	6	6
Connecticut	6	†	...	6	6
Delaware	6	6	20	6	3
District of Columbia	6	10	12	3	3
Florida	8	10	20	5	2
Georgia	7	8	7	6	4
Idaho	7	12	6	(j)	4
Illinois	(j)	7	20	10	5
Indiana	6	8	20	10	6
Iowa	6	8	20	10	5
Kansas	6	10	5	5	3
Kentucky	6	6	15	15	5
Louisiana	5	8	10	5	3
Maine	6	Any rate.	20	6	6
Maryland	6	6	12	3	3
Massachusetts	6	Any rate.	20	6	6
Michigan	5	7	6	6	6
Minnesota	6	10	10	6	6
Mississippi	6	10	7	6	3
Missouri	6	8	10	10	5
Montana	10	Any rate.	10	8	3
Nebraska	7	10	5	5	4
Nevada	7	Any rate.	6	5	4
New Hampshire	6	6	20	6	6
New Jersey	6	6	20	6	6
New Mexico	6	12	7	6	6
New York	6	6	20	6	4
North Carolina	6	6	10	3	3
North Dakota	7	12	10	6	6
Ohio	6	8	5	15	6
Oklahoma	7	12	5	5	3
Oregon	6	10	10	6	6
Pennsylvania	6	6	5	6	6
Rhode Island	6	Any rate.	20	6	6
South Carolina	7	8	10	6	6
South Dakota.	7	12	10	6	6
Tennessee	6	Any rate.	10	6	6
Texas	6	10	10	6	4
Utah	8	Any rate.	8	6	4
Vermont	6	6	8	5	6
Virginia	6	6	20	5	2
Washington	7	12	6	6	3
West Virginia	6	6	10	10	5
Wisconsin	6	10	20	6	6
Wyoming	8	12	5	5	8

New York has by a recent law legalized any rate of interest on call loans of $5000 or upward, on collateral security. †No usury, but over 6 per cent. cannot be collected by law.

A partner signing his individual name to negotiable paper, which is for the use of the partnership firm, binds all the partners thereby. Negotiable paper of the firm, even

though given on private account by one of the partners, will hold all the partners of the firm, when it passes into the hands of the holders, who are ignorant of the fact attending its creation.

Partnership effects may be bought and sold by a partner; he may make contracts; may receive money; indorse, draw and accept bills and notes, and, while this may be for his own private account, if it apparently be for the use of the firm, his partners will be bound by his action, provided the parties dealing with him were ignorant of the transaction being on his private account; and thus representation or misrepresentation of a partner, having relation to business of the firm, will bind the members in the partnership.

In case of death, the surviving partner must account to the representatives of the deceased.

Agents and Attorneys.

An agent or an attorney is one authorized by a person to act for him and in his stead, in the transaction of business for the person appointing said agent or attorney.

In regard to the subject of an agency, the general rule is, that whatever a man may do in his own right he may also transact through another. Things of a personal nature, implying personal confidence on the part of the person possessing them, cannot be delegated.

Infants, married women, lunatics, idiots, aliens, belligerents, and persons incapable of making legal contracts, cannot act as principals in the appointment of agents. Infants and married women may, however, become principals in certain cases.

The act of the agent always binds his principal. Agents who exceed their authority, become themselves personally responsible to their principals.

One should not consent to act as an agent or attorney in complicated matters, except where the powers of this office be explicitly defined in writing.

Agency may be terminated in two ways: (1) by the act of the principal or agent; (2) by operation of law. In the latter case, the termination of the agency is effected by lapse of time, by completion of the subject-matter of the agency, by the extinction of the subject-matter, or by the insanity, bankruptcy or death of either party.

Landlord and Tenant.

Leases for one year or less need no written agreement. Leases for more than a year must be in writing; if for life, signed, sealed, and witnessed in the same manner as any other important document.

Leases for over three years must be recorded. No particular form is necessary.

If no agreement in writing for more than a year can be produced, the tenant holds the property from year to year at the will of the landlord. If there is no agreement as to time, the tenant as a rule holds from year to year.

A tenancy at will may be terminated by giving the tenant one month's notice in writing, requiring him to remove from the premises occupied.

A tenant is not responsible for taxes, unless it be so stated in the lease.

The tenant may underlet as much of the property as he desires, unless it is expressly forbidden in the lease. Tenants at will cannot underlet.

A married woman cannot lease her property under the common law, but this prohibition is removed by statute in most of the States. A husband cannot make a lease which will bind his wife's property after his death.

A lease made by a minor is not binding after the minor has attained his majority. It binds the lessee, however, unless the minor should release him. Should the minor receive rent after attaining his majority, the lease will be therefore ratified. A lease given by a guardian will not extend beyond the majority of the ward.

A new lease renders void a former lease.

In case there are no writings, the tenancy begins from the day possession is taken; where there are writings and the time of commencement is not stated, the tenancy will be held to commence from the date of said writings.

Leases on mortgaged property, whereon the mortgage was given prior to the lease, terminate when the mortgage is foreclosed.

Where a tenant assigns his lease, even with the landlord's consent, he will remain liable for the rent unless his lease is surrendered or cancelled.

A building erected by tenants on foundations sunk into the ground, becomes a part of the realty, and belong to the landlord. Improvements to the building rented, that are nailed or screwed to the building become the property of the landlord. But trade fixtures belong to the tenant, it being presumed when the building is rented for trade purposes that it is permissible to put in the fixtures or make necessary attachments of same to the building. Among our business forms will be found a correct form of lease. Care must be taken in filling necessary blanks, and in ruling lines in spaces not filled by words.

Laws Governing Liens.

In all the States and Canada it is the object of the law to protect the mechanic and laboring man and also the merchant. Hence there are laws in the several States for this purpose. While the general trend is the same, the laws vary in details. It is not difficult to procure a copy of the laws, which every builder and householder should do. Any contractor, sub-contractor or laborer who performs any work, or furnishes any materials, in pursuance of, or in conformity with, any agreement or contract with the owner, lessee, agent or one in possession of the property, toward the erection, altering, improving or repairing of any building, shall have a lien for the value of such labor or materials on the building or land on which it stands to the extent of the right, title and interest of the owner, lessee or person in possession at the time of the claimant's filing his notice with the Clerk of the County Court. Such lien is called a mechanic's lien.

The notice should be filed within thirty days after completion of the work or the furnishing of the materials, and should state the residence of the claimant, the amount claimed, from whom due, when due, and to whom due, the name of the person against whom claimed, the name of the owner, lessee or person in possession of the premises, with a brief description of the latter.

Liens cease in one year after the filing of the notice, unless an action is begun, or the lien is continued by an order of Court.

The following classes of persons are generally entitled to lien: 1. Bailees, who may perform labor and services, on the thing bailed, at the request of the bailor. 2. Innkeepers, upon the baggage of guests they have accommodated. 3. Common carriers, upon goods carried, for the amount of their freight and disbursements. 4. Vendors, on the goods sold for payment of the price where no credit has been expressly promised or implied. 5. Agents, upon goods of their principals, for advancements for the benefit of the latter. 6. All persons are entitled to the right of lien who are compelled by law to receive property and bestow labor or expense on the same.

The right of lien may be waived: 1. By express contract. 2. By neglect. 3. By new agreement. 4. By allowing change of possession. 5. By surrendering possession.

The manner of the enforcement of a lien, whether it be an innkeeper's, agent's, carrier's, factor's, etc., depends wholly upon the nature and character of the lien.

Perishable property on which a lien is held may be sold, and the lien attaches to the proceeds.

Liens take precedence according to priority, and interest on a judgment on a prior lien must also be satisfied before a subsequent lien may be realized upon.

What a Copyright Protects.

A title may be entered, but the copyright covers the book and not the title. A title alone cannot be copyrighted; it can be protected solely as a trade mark. What is a copyrighted manuscript? Copyright pertains to a published book only. So long as a book is in manuscript it is protected by a common law of property; no one can print it without authority unless he steals it. It is when a book is published that the copyright law steps in to protect it. Every day we have evidence that authors have wrong notions of copyright; they make a point of having obtained copyright as if it were something difficult—like a patent—and think they have in some way secured their book and their title by entering the latter.

BOOK III

THE HOME CYCLOPEDIA

OF

HISTORY AND GEOGRAPHY

THE NECESSARY FACTS AND STATISTICS ACCORDING TO LATEST REPORTS OF THE AREAS, PHYSICAL FEATURES, POPULATIONS RELIGIONS AND GOVERNMENTS OF ALL COUNTRIES OF THE WORLD AS INCLUDED IN THE GRAND DIVISIONS OR CONTINENTS, WITH THE IMPORTANT AND INTERESTING FACTS ABOUT EACH COUNTRY AND THE PEOPLE WHO INHABIT IT.

A CONVENIENT BOOK OF REFERENCE FOR HISTORICAL AND GEOGRAPHICAL SUBJECTS

By CHARLES MORRIS, LL.D.

Author of "Civilization, a Study of its Elements," "The Aryan Race," "The Greater Republic," "Dictionary of Universal Biography," etc., etc.

H. C. Pros

ONE OF THE GREATEST INDUSTRIES OF THE WORLD

The raising of cotton, and the spinning and weaving of the raw material into cloth, is one of the greatest industries or the world. This picture shows the interesting process of spinning. The winding frames show how the cotton is drawn out into threads and wound on bobbins ready for weaving.

HISTORY AND GEOGRAPHY

THE EARTH—ITS CONTINENTS—ITS COUNTRIES—ITS PEOPLES—GOVERNMENTS—HISTORICAL, GEOGRAPHICAL, STATISTICAL INFORMATION CONCERNING THEM CONCISELY STATED

THE EARTH, ITS COUNTRIES AND ITS PEOPLES

Astronomy teaches us that the earth, man's home, is one of the class of stars called planets that move around the sun, and the sun and its planets constitute the solar system.

Physical Geography gives descriptions of the earth's surface, and *Political Geography* tells of the countries of the earth and of the people inhabiting them.

History relates of the doings of the peoples of the earth, their forms of government, manners, customs, etc. History and Geography are so closely united, and the lives of nations are so connected with the natural features of the part of the earth they inhabit, that the two subjects should be studied together. The following brief treatise is accordingly arranged:

The earth is divided by geographers into the Eastern and Western Hemispheres. The eastern half is the home of civilization and history. No spot on the Western Hemisphere, with the exception of parts of Greenland, has an unbroken record of over four hundred years; and nine-tenths of the Western Hemisphere's vast area was wholly unknown to civilization even two hundred years ago. The greater portion of it has been explored since the beginning of the nineteenth century.

Archæologists, who dig in mounds and read the signs on ruined temples and on the relics secured from prehistoric graves, tell us there was a high order of civilization in the temperate portions of our hemisphere in ancient times; but of the history of those people and of their governments we have no positive knowledge. They and their civilization had passed away from the Atlantic seaboard when Columbus came and found a savage wilderness. The last vestiges of it were perhaps later found and destroyed by Pizarro.

To-day the Western Hemisphere is more civilized as a whole than the eastern half of the earth. One who would find the lowest order of mankind and the densest ignorance must seek it in Africa, Asia and Oceanica, all of which, with the exception of the extreme northwestern point of Siberia, lie wholly within the Eastern Hemisphere. But the East has also the other extreme. The most learned and advanced state of civilization on earth has its home in Europe. Here we may, therefore, begin this outline of history; a bird's-eye view of all the continents of the earth and its races of people is obtained from the important statistics furnished by the Royal Geographical Society.

The Continent of Europe.

The name of this continent is derived from the mythological Europa, whom Jupiter is reputed to have carried over to its shores from Mount Ida. The country is a peninsula projecting from Asia. It is the smallest of the great continental divisions of the globe, and also the most thoroughly developed and highly civilized. It is situated in almost the same latitude as the United States

POPULATION BY CONTINENTS.

CONTINENTAL DIVISIONS	Area in Square Miles	INHABITANTS Number	Per Sq. Mile
Africa . . .	11,514,000	127,000,000	11.0
America, N.	6,446,000	89,250,000	13.8
America, S.	6,837,000	36,420,000	5.3
Asia	14,710,000	850,000,000	57.7
Australasia	3,288,000	4,730,000	1.4
Europe .	3,555,000	380,200,000	106.9
Polar Reg.	4,888,800	300,000	0.7
Total . .	51,238,800	1,487,900,000	29.0

(The above estimate was made by Ernest George Ravenstein, F.R.G.S., geographer and statistician.)

and Canada, and occupies an area of about one-fifth part of that of America. The population of Europe is about five times that of the United States, divided among twenty-three nations the population of which may be found on the charts. For further statistics concerning the various countries, see special treatment of each hereafter:

POPULATION OF THE EARTH ACCORDING TO RACE.

(Estimated by John Bartholomew, F.R.G.S. Edinburgh.)

RACE	Location	Number
Indo-Germanic or Aryan (white) .	Europe, Persia, etc	545,500,000
Mongolian or Turainian (yellow and brown) . .	Greater part of Asia	630,000,000
Semitic or Hamitic (white)	North Africa, Arabia . . .	65,000,000
Negro and Bantu (black)	Central Africa	150,000,000
Hottentot and Bushman (black)	South Africa	150,000
Malay and Polynesian (brown) .	Australasia and Polynesia .	35,000,000
American Indian (red)	North & South America . .	15,000,000
Total	. . . .	1,440,650,000

The human family is subject to forty-two principal governments. As to their form they may be classified as follows: *Absolute monarchies*, China, Korea, Morocco, Persia, Russia, Siam, Turkey; *Limited monarchies*, Austria-Hungary, Belgium, British Empire, Denmark, Germany, Greece, Italy, Japan, Netherlands, Portugal, Roumania, Servia, Sweden, and Norway, Spain: *Republics*, Argentine Republic, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, France, Guatemala, Hayti, Honduras, Mexico, Nicaragua, Paraguay, Peru, Salvador, San Domingo, Switzerland, United States of America, Uruguay, Venezuela. Besides these are the undefined despotisms of Central Africa, and a few insignificant independent States.

The extreme length of Europe, from northeast to southwest is about 3,400 miles. Its water boundary, if a continuous line, would reach four-fifths of the way around the world. The islands of Europe constitute one-twentieth of its entire area; therefore, in relative extent its coast line surpasses that of all other countries. The coast of Europe is also greatly indented by in-running seas and bays, and the great number of these indentations secure to Europe her commercial supremacy.

The British Isles, are, and for more than a century have been, the headquarters of commercial Europe. They are separated from the Continent by the North Sea, which has an average depth of about 600 feet, and there is much to show that they were once a part of the main land.

The greater part of the Continent is low and level.

Russia and all the territory bordering on the North and Baltic Seas constitute a vast plain called "*Low Europe*," the basin of the Caspian Sea and much of the country of the Netherlands being really below the level of the ocean.

"*High Europe*" is made up of the plateau extending along the southern part of the Continent. This plateau is surrounded by the irregular and broken mountain ranges which constitute the Alpine system, of which the Alps, proper, form the highest range, the other principal ranges being the Pyrenees, Apennines, Balkan, Carpathian and Caucasus Mountains.

The Alps are the sources of the rivers Rhine, Rhone, and Po, and several tributaries of the Danube. The real birthplaces of these streams are in the glaciers, for the great number and extent of which the Alps have long been celebrated. Most of the rivers of Western Europe are navigable, and are connected with one another by canals.

The Lakes of Europe are chiefly located in the northwestern part of the Continent, Lake Ladoga in Russia being the largest. Those in the Swiss Alps, especially Geneva and Constance, are famed for their beauty of scenery. There are many salt lakes in Russia, most of which are situated in the basin of the Caspian Sea.

The Climate of Europe is more equable than that of any other country situated in corresponding latitudes. Its mildness is due chiefly to the southwesterly winds which are warmed by the waters of the Gulf Stream. The southern part of the Continent reaches within 12° of the tropics, while the most northern boundaries do not approach the limit of the frozen zone.

The Products of Europe are grain, hemp, flax, and tobacco in the central region, and grapes, olives, oranges, lemons, figs, mulberries, and cotton in the vicinity of the Mediterranean coast. *Animals* of the large wild type have disappeared before the footsteps of civilization, except in the more thinly settled and least accessible sections. White bear, the reindeer and fur-bearing animals are found in the north; the wolf and wild boar are yet hunted by sportsmen in the forests, while chamois and ibex may be stalked by the bold hunter in the Alpine heights. Fish, which come in schools, abound perhaps as much as ever in the surrounding waters.

Minerals, such as coal, iron, and copper, are widely distributed. Silver, zinc, and lead are plentiful in the central highlands, quicksilver, nitre, sulphur, and salt in the volcanic regions, and coral of great beauty is obtained in the Mediterranean Sea. In richness of mineral products, however, Europe does not compare with North America—the United States and Canada.

Growth of European Civilization.

During the zenith of Asiatic civilization the continent of Europe remained in utter barbarism. At length the light broke out in Greece, and she attained an eminence in learning, arms, art, literature, and law which is yet the enviable pride of nations. Next followed Rome, in the eighth century before Christ, and with its fall the Dark Ages again settled down upon the continent, and had not her treasury of history and learning been preserved in another land the world would have been robbed of this great storehouse of knowledge.

In succession barbarians, tribes of Huns and Goths and Scythians, devastated the greater part of Europe's surface, ultimately to settle and start a new civilization—the Visigoths in Spain, the Lombards in Italy, the Franks in Gaul, the Saxons in Germany and Scandinavia, and the Anglo-Saxons in Britain.

About 800 A.D. the accession of Charlemagne changed the political map of Continental Europe from the Pyrenees to the Carpathian mountains, uniting this vast territory under his dominion. After his death there were carved out of this empire the several kingdoms of France, Germany, Lombardy, Burgundy, Lorraine, etc.

Two centuries later the Scandinavian powers of Sweden, Denmark, Norway, and Russia joined the European family of nations. Near the end of the eleventh century the Moors were driven out of Spain, and the European autonomy was definitely established in 1453, when Constantinople was taken by the Turks.

In the sixteenth century the war which resulted in the independence of the Netherlands was the great historical event. The seventeenth century was characterized by the Thirty Years' War, ending in the triumph of Protestantism in Germany, together with the civil war in England, with Cromwell as its great leader.

The eighteenth century began with the terrible wars of the Spanish Succession, followed by the Seven Years' War, carried on between Frederick II. of Prussia and the Emperor of Austria, England being the ally of the former and Germany, France, Russia, and Sweden assisting Austria. This war, though it terminated in succeeding massacres and later the French Revolution, added new territory to Prussia and established the Prussian line of kings, who, after the Franco-German War in 1870, became the Royal Family of United Germany in the person of King William of Prussia, first Emperor of Germany.

Europe in the 19th Century.

The last five years of the eighteenth, and the first decade of the nineteenth, century marked the rise and wonderful success of Napoleon I., who for twenty years devastated and terrorized Europe as no other military despot has ever done. The combined forces of Europe, in 1815, accomplished his final overthrow at Waterloo, and

the same year a reorganization of Continental Europe was effected by the Treaty of Vienna.

In 1821 the Greeks revolted against the Turks, under whose dominion they had been for more than three centuries. For six years the war continued, until, finally, the Turks were defeated at Navarino in 1827, and by interference of the outside powers Turkey was compelled to grant them independence, and Otho of Bavaria became the first king of modern Greece in 1832. He occupied the throne (31 years) until 1863, when he was dethroned by his subjects, and their present king, Prince George, son of King Christian of Denmark and brother of Queen Alexandra of England, was placed upon the throne. In 1897 Greece again went to war with Turkey for the independence of Crete, but was defeated. However, the powers interfered to save her, and Turkey was further required to grant greater freedom to Crete, the son of the Greek king being made its governor.

In 1831 the new kingdom of Belgium was formed from the lower part of the Netherlands, but an eight-years' war with Holland was necessary to confirm her rights and secure the recognition of the European powers.

"The Year of Revolutions," 1848, witnessed the uprising of popular democratic ideas, which began in France and spread to many nations in Europe, resulting in the fall of several thrones. In 1852 the Second French Empire was established by Napoleon III. In 1854–5 the Crimean War occurred, in which England, France, and Turkey fought against Russia. The battles of Alma, Balaklava and Inkerman, during this war, have added undying celebrity to the plains and hillsides of the Crimean Peninsula. Turkey was saved from Russian power by this war.

In 1859 the Franco-Austrian War resulted in the cession of Lombardy to Italy; 1862 saw the spoliation of Denmark by Austria and Prussia. The "Three Weeks' War" of 1866 aided in the autonomy of Italy as a nation, absorbed into Prussia several of the minor German states, and excluded Austria from the position of leading German power.

In 1870 Napoleon III. made war on Prussia ostensibly to avenge a pretended insult from the Prussian monarch. The injustice of Napoleon's cause and Bismarck's shrewdness united all the German states except Austria in a war against a common enemy. In less than a year the French were beaten. Napoleon was captured and compelled to abdicate the throne. Alsace and Lorraine were taken from France and added to Germany. All Germany (except Austria) united to form the German Empire, with King William of Prussia as the first emperor. France became a republic and has since so remained.

Russia declared war against Turkey in 1877, which ended in the total defeat of the latter in 1878, with a partial dismemberment of the Ottoman Empire. Servia, Roumania, and Montenegro were recognized as independent; East Roumelia was formed south of the Balkans; Bosnia and Herzegovina were occupied by Austria; Cyprus by Great Britain; Bessarabia and other territory in Asia was ceded to Russia, and Bulgaria was granted an autonomic administration. Thus shorn of so large an outlying territory, Turkey became the "Sick Man of Europe." The Armenian massacres of 1896 incensed the Christian world anew against her. The Greek war already referred to in 1897, taking Crete from under her thumb, left her yet weaker. Nothing but the European powers' jealousy of one another keeps the once powerful, but now effete, Ottoman Empire alive.

During the last quarter of the nineteenth century Europe has been comparatively at peace within her own borders. The boundary lines are well settled, and all the powers have looked abroad for their conquests and extensions of dominion. The end of the Boer war of 1901 makes England preeminent in Africa. Spain, stripped of well nigh all her foreign possessions by the war of 1898 with America, has retired within her own narrow borders and is no longer reckoned a factor among the world powers.

The Chinese invasion by England, Russia, Germany, France, Italy and America in 1900, to protect foreign subjects from Chinese persecution, has flung wide the closed door of the East, and left no longer

a doubt that Western civilization is to overrun the Orient, and that the theatre of the world's great historic play for the next half century must be rendered, not in Europe, but upon the stage of the far East, the birthplace of the earliest civilization.

THE GOVERNMENTS OF EUROPE

To treat the governments of Europe individually, it is necessary to confine ourselves to the briefest statements of facts as gleaned from available statistical material.

The United Kingdom of Great Britain and Ireland

comprises England, Wales, Scotland, Ireland, and other British isles, amounting to about 500 in number, one-half of which are inhabited, and all lying just west of the main continent of Europe in the Atlantic Ocean. The total area of the United Kingdom is 120,973 square miles, with a population of 37,888,439. Originally England stood alone. In 1172 A.D. she took Ireland by conquest. In 1282 she conquered and annexed Wales. In 1603 Scotland was induced to join her.

The government is an hereditary limited monarchy, with the sovereign as chief executive. The legislative department embraces the sovereign and the House of Lords and the House of Commons. The House of Lords is composed of 540 members of the titled nobility. There are 670 members in the House of Commons, elected by the people, 465 representing England, 30 Wales, 72 Scotland, and 103 Ireland.

England and Wales form the southern and larger part of the island. Scotland forms the northern and smaller part. Ireland forms an independent island, surrounded by the Atlantic Ocean on all sides except the east, where it is separated from Great Britain by St. George's Channel, the Irish Sea, and the North Channel.

Religiously the inhabitants of the United Kingdom are divided as follows: Roman Catholics, which predominate in Ireland, about 6,000,000; Episcopalians, which predominate in England, about 14,000,000; Presbyterians, which predominate in Scotland, about 1,400,000. All other branches besides those mentioned and Jews, are classed as Dissenters, of which there are 6,000,000. The Jewish faith numbers 60,000.

London, the capital of the British Empire, is the largest city and chief commercial emporium of the world, with a population of nearly 5,000,000 inhabitants. In commerce, industry and finance, as also in art and literature, London stands as the chief centre of the world. It also ranks first as a seaport and in manufacture. Among its numerous and magnificent buildings, the most important are Westminster Abbey, St. Paul's Cathedral, Buckingham Palace, the Houses of Parliament and the Tower.

The reign of Queen Victoria, who ascended the throne in 1837, was in all respects the golden age of British history. She died January 22, 1901, and was succeeded by her son, the Prince of Wales, as King Edward VII.

The British Empire.

The little United Kingdom just described, with less than 38,000,000 people and of diminutive area, is but the head of the gigantic body of the British Empire, the entire population of which, since the annexation of the South African Republics, in 1900, is over 381,000 000 souls, with a territory covering about 11,500,000 square miles. The East Indian possessions of the British Empire alone embrace an area larger than the whole continent of Europe, exclusive of Russia. Her North American possessions are larger still, and, including Hudson Bay and the Great Lakes, cover an area greater than all Europe. The possessions in Australasia are next in size, embracing the great Island of Australia, which like Canada is divided into provinces with their provincial and central legislative bodies; the islands of New Zealand and Borneo are other important British Colonies. Since the Boer-British War of 1899–1900–01 England's hold upon the Continent of Africa is supreme, and her subject territory there is of vast dimensions. How this stupendous empire has been built, together with the area and population of the different sections, is shown by the following table:

COLONIES AND DEPENDENCIES.

Continents	Square Miles	How Obtained	When	Population
EUROPE:				
Gibraltar	2	Conquest	1704	25,869
Malta, etc	122	Treaty cession	1814	165,662
ASIA:				
India (including Burmah)	1,800,258	Conquest / Transfer from East India Co.	Begun 1757 / 1858	287,223,431
Ceylon	25,365	Treaty cession	1801	3,008,239
Cyprus	3,584	Convention with Turkey	1878	187,000
Aden and Socotra	3,070	(Aden) conquest	1839	44,000
Straits Settlements	1,500	Treaty cession	1785–1824	506,577
Hong Kong	30½	Treaty cession	1841	221,441
Labuan	31	Treaty cession	1846	5,853
British North Borneo	31,000	Cession to Company	1877	150,000
AFRICA:				
Cape Colony	221,310	Treaty cession	1588–1814	1,527,224
Natal	21,150	Annexation	1843	543,913
St. Helena	47	Conquest	1673	4,116
Ascension	38	Annexation	1815	200
Sierra Leone	15,000	Settlement	1787	300,000
British Guinea, Gold Coast, etc	339,900	Treaty cession	1872	23,455,000
Mauritius, etc	1,063	Conquest and cession	1810–1814	392,500
*British South and East Africa	1,989,247	Conquest and cession	1870–1890	14,911,000
AMERICA:				
Canada Proper	370,488	Conquest	1759–60	4,833,239
New Brunswick	28,200	Treaty cession	1763	
Nova Scotia	20,907	Conquest	1627	
Manitoba	73,956	Settlement	1813	
British Columbia, etc.	383,300	Transfer to Crown	1858	
Northwest Territories	3,257,500	Charter to Company	1670	
Prince Edward Island	2,133	Conquest	1745	
Newfoundland	42,200	Treaty cession	1713	198,000
British Guiana	76,000	Conquest and cession	1803–1814	282,000
British Honduras	7,562	Conquest	1798	28,000
Jamaica	4,193	Conquest	1655	581,000
Trinidad and Tobago	1,754	Conquest	1797	205,000
Barbadoes	166	Settlement	1605	172,000
Bahamas	5,794	Settlement	1629	48,000
Bermuda	41	Settlement	1612	16,000
Other Islands	8,742	. . . .	. .	255,000
AUSTRALASIA:				
New South Wales	310,700	Settlement	1788	1,132,234
Victoria	87,884	Settlement	1832	1,140,405
South Australia	903,690	Settlement	1836	320,431
Queensland	668,497	Settlement	1824	393,718
Western Australia	975,876	Settlement	1828	49,782
Tasmania	26,215	Settlement	1803	146,667
New Zealand	104,032	Purchase	1845	626,658
Fiji	7,423	Cession from the natives	1874	125,402
New Guinea (British)	234,768	Annexation	1884	350,000

*Statistics for Orange Free State and South African Republic not yet available.

France.

All together the Republic of France controls approximately sixty-three and a quarter million people, and three and one-half millions of square miles of territory. But France proper, without her colonies, has only 38,517,975, and 204,177 square miles. The home territory is bounded on the north by the English Channel; on the west by the Bay of Biscay; on the south by Spain and the Mediterranean Sea; and on the east by Belgium, Germany, Switzerland, and Italy. Religion, Roman Catholic. About 693,000 Protestants. GOVERNMENT—Republican. Executive, the President of the Republic. Legislative, the Senate and the Chamber of Deputies, the former composed of 300 members, and the latter of 584 members. EDUCATION is entirely under Government supervision, and the schools rank among the best in the world. The Republic of France has been, for hundreds of years, one of the great powers of Europe. The geographical situation of the country is admirably adapted for political and commercial eminence. It is crossed on the north by the parallel of latitude which forms a part of the northern boundary of the United States. Its frontiers are open to the sea and its plains are fertile. The larger rivers are navigable for a considerable distance inland and are connected by canals. More than one-half of all the land is under cultivation, and its splendid climate has given this country the name of "Sunny France." Among its chief manufactures are silk, lace, ribbons, jewelry, and perfumery. Wine-making is one of the most profitable industries of France.

The French people are noted for their politeness, intelligence, gaiety and taste. They are very patriotic, possess a great national pride, and seldom emigrate. Their love of home has undoubtedly done much to give England an advantage over France as a colonizing nation.

The chief city and capital of France is Paris, the most beautiful city in the world, with its broad streets, smooth pavements, stately trees, and miles upon miles of magnificent buildings and palaces, surrounded by gardens, fountains, and statues. This city sets the fashions for the world, and is its mart for fancy goods. The largest library in the world is at Paris, and here, also, may be said to be the headquarters for the study of the mental and psychic sciences, as well as of chemistry and art. The Louvre, formerly a royal palace, contains the most extensive collection of modern pictures and sculptures in the world.

The foreign possessions of France are located in South America, Asia, Africa, and also many islands, the principal divisions, with statistics, being as follows:

COUNTRIES.	Population.	Square Miles.	Capital Cities.
Algeria	3,870,000	260,000	Algiers.
Senegal, etc.	183,237	580,000	St. Louis.
Tunis	1,500,000	45,000	Tunis.
Cayenne	26,502	46,697	Cayenne.
Cambodia	1,500,000	32,254	Saigon.
Cochin-China	1,223,000	13,692	....
Tonquin	2,000,000	60,000	Hanoi.
New Caledonia	62,752	7,624	Noumea.
Tahiti	12,800	462	....
Sahara	1,000,000	1,550,000	....
Madagascar	3 500,000	230,000	Antananarivo

Since the establishment of the French Republic in 1870, there have been seven presidents: Thiers, McMahon, Grevy, Carnot, Perier, Faure, Loubet. The present ruler, Emile Loubet, was elected February 18, 1899, to succeed President Faure, who died suddenly the night before.

Spain.

At one time Spain was the most important nation of the world, governing a population of over 80,000,000 souls, with colonies exceeding those of any other nation on earth. At present she has been stripped of nearly all her colonies, her dominion extending at present only over her home territory with a, population of 18,114,388, and an area of 401,897 square miles, bounded on the north by France and the Bay of Biscay; on the west by the Atlantic Ocean and Portugal; and on the south and east by the Mediterranean Sea. RELIGION—Roman Catholic, except 34,000 (6,654 Protestants). GOVERNMENT—Constitutional monarchy. Executive, the King. Legislative, the King and Cortes, composed of the Upper House with 360 members and Chamber of Deputies

of 431 members. EDUCATION, 30,000 elementary schools with 1,700,000 pupils ; ten universities with 15,700 students.

Though there are elections in Spain, universal suffrage does not exist. The franchise is peculiar. A Spaniard, to vote, must be of age, domiciled twenty-five years, must contribute $5.00 as a real-estate tax, and double that sum industrial tax. Politicians in power do not try to increase voters, but to diminish their number. All priests and their curates, members of academies and ecclesiastical chapters are permitted to vote.

Madrid is the capital city, with a population of over 400,000. Comparatively little manufacturing is done in Spain. Agriculture is the principal industry, and this is conducted with implements far behind the age.

The history of Spain is a long and dramatic one. The last chapter ended with the Spanish-American War in 1898, the results of which took from her the last of her colonial possessions of consequence.

Alfonso XIII., the present King, was born in 1886, ruling through his mother, Maria Christina, as Queen Regent until of age.

Portugal.

The Kingdom of Portugal comprises 34,028 square miles, with a population of 4,708,000.

Portugal is bounded on the east and north by Spain, and on the west and south by the Atlantic Ocean. RELIGION—Roman Catholic ; 500 Protestants. GOVERNMENT—Hereditary limited monarchy. Executive, the King and Cabinet. Legislative, the Cortes, composed of House of Peers with 162 members, and House of Commons with 149 members. EDUCATION—5,500 schools with 240,000 pupils ; one university with 670 students.

During the fifteenth century Portugal exceeded any other European nation in power and prosperity. Her ships were in every port. She had colonies throughout the world. Her decline, however, was nearly as rapid as her elevation had been. She finally became a dependency of Spain, but in 1640 threw off the Spanish yoke, and has since, except during the dominancy of Napoleon, been independent.

Lisbon, the capital of Portugal, and Oporto, are its principal commercial cities, in which all the manufacturing interests of the country are centered. For want of roads, internal commerce is almost entirely neglected. In 1785 a terrible earthquake destroyed Lisbon, 60,000 people perishing.

Charles I., King of Portugal, was born in 1863, and acceded to the throne in 1880.

Portuguese colonies in Africa number 5,416,000 population and 841,025 square miles ; in Asia 847,503 population and 7,923 square miles.

Italy.

This country has increased rapidly in population during recent years. It now has about 35,000,000 subjects, with a territory of 114,610 square miles.

Italy was formerly called Rome, which empire included, in the process of time, nearly all the known world. Latterly it has been designated as the "Garden of Europe" and the "Cradle of Art."

> "A land of art and beauty rare,
> Of sunny skies and balmy air."

The Peninsula of Italy projects into the Mediterranean Sea, which forms its southern boundary. On the north it is bounded by Austria and Switzerland ; on the west by France and the Tyrrhenian Sea ; and on the east by the Adriatic Sea. RELIGION—Roman Catholic, but about 62,000 Protestants and 38,000 Jews. GOVERNMENT—Limited monarchy, Executive, the King ; Legislative, the Parliament, consisting of two Chambers—the Senate of 367 members, made up of the Royal Princes and any number of distinguished men above forty years of age who are nominated by the King ; the second Chamber, that of the Deputies, consists of 508 members elected by the people. EDUCATION—Italy has twenty-one universities with about 14,000 students. Her primary schools are mostly parochial, or are conducted under the direction of the Catholic Church. The majority of the people are unable to read or write.

Rome, the capital of Italy, has a population of over 500,000 and is famous for its ruins, art schools and fine buildings, as well as for the fact that it is the home of the

Pope, the head of the Catholic Church. The ancient city was situated on seven hills. Modern Rome stands on a plain northwest of these hills, and is surrounded by a wall fifteen miles in circuit.

St. Peter's Cathedral at Rome is the largest and grandest in the world, and *The Vatican*, a palace of the Pope, has many thousand rooms, and the most valuable picture-gallery in the world. Its museum of statuary is nearly a mile in length. *The Coliseum* at Rome is the grandest ruin in the world. This and the Catacombs—subterranean passages and chambers extending far under and around the city—together with the ruins of the Forum, constitute objects of unending interest to students. In fact, with Naples, Pompeii, and Vesuvius added to the foregoing, there is much in Italy to tempt the tourist.

The present King, *Victor Emmanuel III.*, was born in 1869, and acceded to the throne after the assassination of his father, King Humbert, in 1900.

In addition to home territory and population already mentioned, Italy has colonies in Abyssinia numbering 4,500 inhabitants, 189,000 square miles; in Eritrea 660,000 inhabitants, 56,000 square miles, and on the Somal Coast 210,000 inhabitants, 70,000 square miles.

Greece.

With a population of 2,433,806 and 25,041 square miles of territory, the little Kingdom of Greece, only about two-thirds the size of the State of Maine, sits unique among the monarchies of Europe. Surrounded by islands, and penetrated by the sea, it was a natural starting-point for the introduction of the civilization of the Egyptians and the Phœnicians into Europe—modified and improved.

The ancient Greeks were a beauty-loving, song-making, cultured nation, and it is to them that modern civilization owes more than to any other ancient people. The islands of Greece have been famous in song and story longer than any other land. In the days of Homer Crete had at least one hundred cities. Athens, the modern capital of Greece, was for centuries the centre of the world's civilization. Its population at present is 115,000.

Greece is bounded on the north by Turkey in Europe; on the east by the Ægean Sea; on the south by the Mediterranean Sea; and on the west by Turkey and the Ionian Sea. RELIGION—Greek Orthodox Church with the exception of 46,000. GOVERNMENT—Limited monarchy. Executive, the King. Legislative, the Boulé (Chamber of Deputies), consisting of 150 representatives. EDUCATION—There are 2,600 schools attended by 140,000 pupils, and one university with 2,400 students.

King George, son of King Christian of Denmark, is the present sovereign of Greece. He was born in 1845, and ascended the throne in 1863, at 17 years of age.

The Austro-Hungarian Empire.

Comprises the Empire of Austria and the Kingdom of Hungary, with 201,591 square miles and 41,827,700 population. It is bounded on the north by Poland, Silesia, and Saxony; on the west by Bavaria and Switzerland; on the south by Venetia, the Adriatic and the Balkan States; and on the east by Moldavia and West Russia. RELIGION—Roman Catholics, 25,598,000; Protestants, 3,630,000; Jews, 1,646,000. GOVERNMENT—Austria and Hungary form a hereditary dual-monarchy, each country having its own Parliament, Ministry, and Administration. They are both united under a hereditary sovereign, the Emperor of Austria being also King of Hungary, and a controlling body known as the "Delegations," or Parliament, of 120 members, one-half of whom are chosen by and represent the Legislature of Austria proper, and the other half that of Hungary. Within the jurisdictions of the Delegations are all matters affecting the common interests of the two countries, notably foreign affairs, war, and finance, each of these having its own executive department. According to the military law, the obligation for service is universal; the time of service in the line is two years; in the reserve, seven years; in the landwehr, two years.

The mines of Austria are among the richest in Europe, gold, silver, lead, copper, and iron being widely distributed. The

largest cave in Europe is in the Julian Alps in Austria. The coal and salt mines of Austria are the richest in the world. The musical instruments of Vienna are famous. This city is the capital and metropolis of the empire, with a population of 1,365,000, the fourth city of Europe, and one of the most beautiful in the world. Its streets converge towards a common centre, like the spokes of a wheel. Buda-pest (really two cities standing on opposite banks of the Danube) is the capital of Hungary, with a population of more than half a million.

The city of Carlsbad stands over a vast caldron of boiling water, which is noted for its medicinal qualities, and attracts health-seeking tourists from every land. Salts are extracted from these boiling springs and sold all over the world. The present venerable emperor, Francis Joseph, was born August 30, 1830, and ascended the throne December 2, 1848.

Germany.

The German Empire, with its 52,280,000 inhabitants and 211,108 square miles, consists of the four kingdoms of Prussia, Saxony, Bavaria, and Wurtemburg, six grand-duchies, five duchies, seven principalities, the three free cities of Lubec, Bremen, and Hamburg, and the territory of Alsace-Lorraine, the latter acquired from France in the settlement of the Franco-Prussian War of 1870.

On the north Germany is bounded by the North Sea, Denmark, and the Baltic Sea; on the east by Russia; on the south by Austria and Switzerland; and on the west by France, Belgium, and the Netherlands. RELIGION—Protestants, 30,450,130; Roman Catholics, 17,236,500; Jews, 586,-200. GOVERNMENT—The twenty-six states which comprise the German Empire are united into a Confederation. The supreme direction of the military and political affairs is vested in the King of Prussia, as Emperor of Germany; controlled by the Bundesrath, or Federal Council, consisting of sixty-two members appointed by the individual states of the Empire, and the Reichstag, or Diet of the Realm, composed of 397 members elected by universal suffrage. EDUCATION—There are twenty-one universities, attended in round numbers by 28,000 students; 57,000 elementary schools, with 7,300,000 pupils; and 1,484 higher class and technical schools, with 280,000 pupils.

The Germans are intelligent and industrious, and their schools are among the best in the world—education being compulsory. Every German youth is also required to serve from one to three years in the army. It is more necessary for Germany to maintain a large standing army than for any other European nation, because the Empire lies in the very heart of Europe and is poorly protected by nature from its enemies. The Germans are music-loving people, and many of the world's greatest musicians are natives of that country. They are also a remarkably artistic and mechanical people, in almost every house children, men and women, cutting, carving, whittling, gluing, and painting.

Berlin, the capital, with 1,843,000 inhabitants, is by far the largest town in Germany, and for the beauty and size of its buildings, the regularity of its streets, the importance of its institutions of science and art, and its activity, industry, and trade, is one of the finest cities in Europe. Built in a sandy plain on both banks of the Spree, it is ten miles in circumference. The most celebrated street is that called "Unter den Linden," a broad and imposing avenue, planted with four rows of lime trees, ornamented by an equestrian statue of Frederick the Great, and terminated at one end by the Brandenburg Gate—a colossal structure, surmounted by a statue of Victory in a car drawn by four horses, and by the royal palace at the other. Around the principal squares and streets are grouped numerous public buildings, among which are the royal castle and palace, the arsenal, the university, museum, exchange, opera-house, theaters, and palaces of the princes. Berlin is the great centre of instruction and intellectual development in Northern Germany. It is also the first city in Germany for the variety and importance of its manufacturing products, which comprise, among other things, the beautiful cast-iron ornaments known as Berlin jewelry.

William II., the Emperor of Germany, was born in 1859, and succeeded his father on the German throne in 1888.

Germany has colonial possessions in Africa embracing 822,000 square miles, with a population of 5,950,000 inhabitants.

Switzerland.

The ancient Helvetia of the Romans is to-day the Swiss Republic, embracing 15,981 square miles, with a population of 2,933,334. Switzerland is the highest country in Europe. One-third of the whole republic lies above the line of perpetual snow. The poet aptly says:

> 'Upon the heights of Alpine lands
> The Swiss Republic proudly stands."

The surface of Switzerland exceeds in sublimity and ruggedness every other part of Europe. The immense mass of Mt. St. Gothard forms the centre or nucleus of a system of mountains, covered with perennial snow, the peaks of which rise from 5,000 to 15,000 feet above the sea level. The chief passes are St. Bernard, 8,120 feet; Cervin, 10,938 feet; Simplon, 6,595 feet; St. Gothard, 6,936 feet; Splugen, 6,945 feet. RELIGION—58 per cent. Protestants; 41 per cent. Roman Catholics. GOVERNMENT—Federal Republic of twenty-two Cantons. Executive, Federal Council of seven, including the President. Legislative, the State Council of forty-four members, and the National Council of 143 Representatives. Education—Compulsory. There are four universities (Basle, Berne, Zurich, and Geneva), with 1,500 students, and 5,500 elementary and secondary schools with 500,000 pupils.

The Swiss are a simple, brave people, and the security of the mountain recesses has fostered their independent spirit. The St. Gothard's Tunnel through the Alps gives Switzerland a direct outlet into Italy. This tunnel represents the most stupendous work of engineering known in the world.

Berne, the capital of the Republic, is a thriving city, and one of the handsomest in Europe. It is celebrated for its numerous fountains. Geneva is the largest city, and is noted for its manufacture of watches.

Belgium.

Belgium is the most densely-settled country on the earth. The population in January, 1900, was 6,744,553, crowded into an area of 11,313 square miles, making an average of 593 persons to each square mile of territory.

On the west Belgium is bounded by the North Sea; on the north by the Netherlands; on the east by Holland; and on the south by France. RELIGION—The Roman Catholic religion is professed by nearly the entire population, though full liberty and social equality are granted to all confessions. There are 15,000 Protestants, and 3,000 Jews. GOVERNMENT—Constitutional and hereditary monarchy. Executive, the King and ministry. Legislative, vested in the King, the Chamber of Representatives, and the Senate. The Chamber consists of 138 members, and the Senate of sixty-nine.

Much of Belgium in the west is below the level of the sea, from which it has to be protected by dikes and sand dunes. The soil is unusually fertile. Minerals are abundant, the inhabitants very industrious, and manufacturing is extensively carried on, Belgium surpassing all other European countries except England and Germany. Brussels is the capital city, with a population of 210,000. Antwerp is the largest city, with a population of 282,000. If the immediate suburbs of Brussels were taken in, as is done in our American cities, in would increase the population to more than half a million. The great battle of Waterloo, in which Napoleon was defeated, was fought a few miles from the city of Brussels.

The Netherlands (Holland).

As Switzerland is the highest country in Europe, so The Netherlands is the lowest. One-third of Switzerland lies above the snow-line; one-third of Holland is below the level of the sea. There are no forests, rocks, or hills in the whole country, the highest land being less than 200 feet above the ocean, which is literally dammed out of the land by sand mounds along a part of the coast and dikes built at other places.

The country comprises 12,680 square miles (200 miles long by 60 wide), with a population of 4,550,870 people. It is bounded on the west and north by the North Sea; on the south by Belgium; and

on the east by Germany. RELIGION—Protestants, 2,469,814; Roman Catholics, 1,439,-137; Jews, 81,693. GOVERNMENT—Hereditary and constitutional monarchy. Executive, the sovereign. Legislative, the sovereign and Parliament or States-General, composed of the First Chamber with fifty members, and the Second Chamber with 190. EDUCATION—There are four universities (Leyden, Groningen, Utrecht, and Amsterdam), attended by over 2,000 students; 1,278 private and higher class schools, with over 175,000 scholars; 2,923 public elementary schools, with 45,000 pupils.

Next to England, the Netherlands possess the most important colonial possessions. Nearly 23,000,000 of her colonial inhabitants are in the Island of Java; the balance are principally in Borneo, the Celebes, the Moluccas, Sumatra, Surinam, and New Guinea.

Travelers in Holland are struck by the novel appearance of windmills scattered all over the land, and canals running through it like roads. Windmills grind the grain, saw the wood, wash the garments, pump the water off the lowlands, and do all sorts of work. In summer the canals are used for boats, and in winter as roads for vehicles, sleighing and skating. The chief city of Holland is Amsterdam, its commercial centre, with a population of 513,000. It stands on soft, wet ground, the houses being generally built on piles. The capital is The Hague, with a population of 200,000

Queen Wilhelmina, the present ruler of Holland, succeeded to the throne in 1890, at the age of ten years. In February, 1901, she was married to Duke Henry of Mecklenburg-Schwerin. She is universally beloved, and regarded as a wise ruler.

Denmark.

Denmark, with Norway and Sweden, forms ancient Scandinavia. The country proper consists of only 14,780 square miles, and has 2,172,205 inhabitants. It is bounded on the west by the North Sea; on the northwest by the Skager Rack; on the east by the Cattegat, the Sound, and the Baltic; and on the south by the Baltic and the German province of Schleswig. The State religion is Lutheran, though complete toleration is ex-

tended to every sect. In 1880, only 17,526 persons did not belong to the Lutheran Church. Of this number 3,946 were Jews and 2,985 Roman Catholics.

The Government is an hereditary limited monarchy. Executive, the King and Ministry. Legislative, the Rigsdag, or Diet, composed of the Landsthing, or upper House, with sixty-six members, and the Folkething, or House of Commons, with 102 members. Elementary education is compulsory. The university at Copenhagen has about 1,300 students. There are also forty-five colleges and higher schools, and 2,940 parochial schools.

The climate of Denmark is generally cold and murky in winter. Copenhagen, the capital, is the chief city, with a population of over 300,000. King Christian IX. ascended the throne in 1863, at the age of forty-five years. He is very democratic in his habits, loves to mix with his people, and is one or the most beloved monarchs of Europe. King Christian is also remarkable for having his descendants on many European thrones. The King of Greece is his son, the present Czar of Russia is his grandson, and his daughter Alexandra married the Prince of Wales, and is consequently now the Queen of England.

Outside of her home territory Denmark owns the islands of Iceland and Greenland, the Faroe Islands, and some of the smaller West Indies. These added to the home territory increase its square miles near ten times, but augment its population only about 120,000 souls.

Sweden and Norway.

These two kingdoms, forming the Scandinavian Peninsula, comprise jointly 297,-321 square miles and 6,785,898 population.

Norway and Sweden are bounded on the north by the Arctic Ocean; on the east by Russia, the Gulf of Bothnia, and the Baltic Sea; on the south by the Baltic Sea, the Sound, Cattegat, and Skager Rack; and on the west by the Atlantic Ocean.

Norway and Sweden together form an hereditary and limited monarchy, the King of Sweden being also King of Norway. But each country has a separate legislative government, which in Norway consists of the

King as executive and the Storthing, with twenty-eight members, and the Odelsthing, with eighty members, as the legislative department. In Sweden the King is the executive, while the legislative comprises the Diet, composed of two chambers, the first with 142 members and the second with 214 members.

Education is fostered in both countries. In Norway there is one university with about 1,400 students, and nearly 7,000 elementary schools with 380,000 pupils. Sweden has two universities, with from 2,500 to 3,000 students, and more than 10,000 elementary and other schools, with upwards of 700,000 pupils. The Lutheran Protestant religion prevails in both Norway and Sweden.

Oscar II., the present King of Sweden and Norway, was born in 1829, and succeeded to the throne in 1872, at the age of forty-three.

The Russian Empire.

The Russian Empire, next to that of Great Britain, is the most extensive dominion in the world, embracing, as it does, 8,660,395 square miles, with a population in round numbers of 136,000,000 of people. Great Britain rules over about 3,000,000 square miles of territory in excess of that of Russia, and her entire subject population is more than twice that of Russia. The population of China (402,680,000) is still larger, but China's dominion covers less than half the area dominated by the Russian Empire, which includes about one-half of Europe and all of the northern part of Asia. The area of European Russia is about two thirds that of the United States, while Asiatic Russia includes Siberia, Turkestan, and Trans-Caucasia, or Georgia.

Russia in Europe is bounded on the east by Siberia and the Caspian Sea; on the south by Persia, the Black Sea, and Turkey; on the west by Austria, Germany, the Baltic Sea, and Sweden; and on the north by the Arctic Ocean. The established religion is the Russo-Greek. Protestants, 4,766,000; Roman Catholics, 8,910,000. GOVERNMENT—Absolute hereditary monarchy. Executive and legislative, the Czar. Administrative entrusted to four Councils, the Council of the Empire, the Ruling Senate, the Holy Synod, and the Committee of Ministers. Finland has had until recently a partly independent government—Grand Duke, the Czar. EDUCATION—Including Finland, there are nine universities with 14,000 students, and 38,000 schools with 2,250,000 pupils. In 1882 only 19 per cent. of the Russian recruits could read and write.

Recent statistics moreover, show that only 2 per cent. of the population attend school, and only one young man in every five enrolled in the army can read or write. It has been the policy of the Russian Government to discourage education among the masses. The state considers it dangerous that they should acquire an education.

Russia in Asia is bounded on the north by the Arctic Ocean; on the east by the Pacific Ocean; on the south by the Chinese Empire, Bokhara, Afghanistan, Persia, and Turkey in Asia; and on the west by European Russia. It comprises 6,645,720 square miles, with a population in round numbers of about 17,000,000. RELIGION—Christianity and Mohammedism prevail in Caucasia, while in Central Asia and Siberia Christianity is professed by the Slavs, and Buddhism, Shamanism, and Mohammedanism by the native races.

GOVERNMENT—For administrative purposes the country is divided into five general governments—Caucasia, Turkestan, Stepnoye, Eastern Siberia, and Amur. At the head of each of these is either a viceroy or a governor-general, who represents the Czar, and has the supreme control of all affairs, whether civil or military.

In 1904 the Russian advance in the far east had reached a point to jeopardize the interests of Japan, who declared war. The Russian armies were defeated and navy annihilated. Port Arthur was taken, Russia driven from Manchuria and peace terms negotiated through the help of the U. S. Government late in 1905.

St. Petersburg, the capital, founded by Peter the Great, is the principal city, with a population of 1,267,000. Everything about the city is on a colossal scale, the streets wide, buildings large, area extensive.

Moscow, the Holy City of the Russians, with a population of nearly one million, is

the second city in importance. It is irregularly built, and presents a most striking contrast of costly palaces, wretched hovels, and magnificent churches with gilded domes huddled together.

The present Czar of Russia, Nicholas II., was born in 1868, and succeeded his father on the throne in 1894.

Turkey.

The Ottoman Empire includes Turkey in Europe, Turkey in Asia, a large part of northeastern Africa, and several islands, embracing in all 1,652,533 square miles, with a population of 33,559,787.

Turkey in Europe now, strictly speaking, only comprises the provinces, nearest Constantinople, the capital, the remainder of its territory being divided among the independent and tributary states of the Balkan Peninsula. RELIGION—More than one-half of the population are Christians, chiefly belonging to the Greek Church; the remainder consist of Mohammedans, with a few Jews. GOVERNMENT—Absolute monarchy. The Sultan is ruler,and his will is absolute, in so far as it is not in opposition to the precepts of the Koran. The legislative and executive authority is exercised, under the supreme direction of the Sultan, by the Grand Vizier, the head of the temporal government, and the "Sheik-ul-Islam," the head of the Church.

Turkey in Asia, with a population of about 17,000,000, embraces an area of 680,000 square miles.

On the northeast it is bounded by Transcaucasia; on the east by the Black Sea and the Sea of Marmora; on the west by the Ægean, Mediterranean, and Red Seas; on the south by Arabia and the Persian Gulf. and on the east by Persia and the Persian Gulf.

EDUCATION in Turkey, among the Mohammedans, consists almost entirely of learning the Koran and certain verses of

THE COUNTRIES OF EUROPE.

Political Division	Form of Government	Areas in British Square Miles	Capitals
1. Russia in Europe	Empire	2,266,983	St. Petersburg.
2. Germany	Empire	212,091	Berlin.
3. Austria and Hungary	Empire	240,943	Vienna.
4. France	Republic	204,177	Paris.
5. Great Britain and Ireland	United Kingdom	122,511	London.
6. Italy	Kingdom	114,296	Rome.
7. Spain	Kingdom	192,957	Madrid.
8. Sweden and Norway	Kingdom	293,918	Stockholm, Christiania.
9. Belgium	Kingdom	11,366	Brussels.
10. Roumania	Principality	48,307	Bucharest.
11. Turkey in Europe	Empire	75,523	Constantinople.
12. Portugal	Kingdom	36.462	Lisbon.
13. Holland	Kingdom	20,527	Amsterdam.
14. Switzerland	Federal Republic	15,716	Berne.
15. Denmark	Kingdom	14,553	Copenhagen.
16. Bulgaria		24,360	Sofia.
17. Servia	Principality	20,850	Belgrade.
18. Greece	Kingdom	19,941	Athens.
19. Montenegro	Principality	3,550	Cetigne.
20. Andorra	Republic	148	Andorra.
21. Liechtenstein	Principality	63	Liechtenstein.
22. San Marino	Republic	26½	San Marino.
23. Monaco	Principality	6	Monaco.
		3,963,333	
Less—Transcaucasian provinces of Russia		156,564	
Totals of Europe		3,806,769	

poetry. There are, however, public schools of an inferior grade throughout the empire, which are poorly patronized. There are also colleges and public libraries attached to a number of the principal mosques, but the instruction afforded by these establishments is limited. The Christians have established a number of schools, which are, however, discouraged by the government.

Abdul Hamid, the present Sultan of Turkey, was born in 1842, and ascended the throne in 1876.

Constantinople, the capital, is a beautiful city of nearly 1,000,000 inhabitants, and is situated on the Bosphorous. Of its many beautiful buildings, St. Sophia is the finest example of Byzantine architecture.

The Balkan States.—These are four states which formerly were part of the Turkish Empire which have been set apart as independent or semi-independent governments, but which have very little political influence or importance.

Roumania.—Area 48,300 square miles. POPULATION—5,800,000. RELIGION—The Greek Orthodox predominates. GOVERNMENT—Vested in King, assisted by council of State, a Senate of 120 members and Chamber of Deputies. Sovereign, Charles I. acceded to throne 1881.

Bucharest is capital and centre of trade.

Bulgaria.—Area, 37,060 square miles POPULATION—3,309,816. Capital city, Sofia. RELIGION is Greek Orthodox. GOVERNMENT—A constitutional monarchy, vested in a Prince, council of ministers and a national assembly. Reigning Prince is Ferdinand who acceded in 1887.

Montenegro.—Area, 3,630 square miles. POPULATION—228,000. Capital city, Cetigne. GOVERNMENT—Similar to that of Bulgaria, with Nicholas as reigning Prince.

THE CONTINENT OF ASIA

Asia, the supposed birthplace of mankind, is the largest of the continents and the most populous. More than half the human race live on this continent. It comprises about one-third of the land surface of the earth—being twice as large as North America and nearly five times the size of the United States. Its greatest length is 7,500 miles—nearly one-third the circumference of the earth—and it has at once the coldest and the hottest country, as well as the highest and lowest land, within its borders.

Siberia is swept by icy winds from the Arctic Ocean; Arabia by the hot and fatal simoon. The Himalaya Mountains are the highest in the world; the Caspian Sea and much of the land near it are below the level of the ocean. Mecca, the birthplace of Mohammed, in Arabia, is the hottest, and Yakootsk, on the Lena River in Siberia, is the coldest city in the world Northwestern Asia is a continuous plain; the southeastern part is an elevated plateau traversed by lofty mountains, and the islands attaching to the continent are but continuations of the mountain chains extended into the sea. They are all of volcanic origin. The highest peak on earth is Mount Everest in the Himalayas. Its summit is 29,000 feet above the sea, 6,000 feet above the loftiest peak in America.

The rivers in Asia, though of great length, are distinguished for their narrow valleys, and the Obi is the only one that is navigable to any considerable distance. The Yang-tse and Hoang rivers are subject to great changes brought about by the shifting of their channels. In 1851 the Hoang-Ho burst through its banks and poured its waters into the gulf of Pichulu, so changing its course within two years that its mouth was located 250 miles from its former position. The river valleys and plains, which are well watered, are extremely fertile, while the highest central regions and plateaus are dry, sandy and barren. The deserts of Arabia, Persia, Turkestan and Gobi receive little, and, in some places, no rain, while the southern slope of the Himalayas is annually inundated. India is traversed by winds which scorch the entire surface for half the year, and flood it with rain the other half. Destructive cyclones also visit the warm coasts, piling up the waters of the Bay of Bengal and submerging the lowlands of the Ganges.

The mineral products of Asia are numerous, and have been from remote antiquity. No land is more famous for its precious stones, unless it be Africa since the late discovery of the gold and diamond fields there in the last half of the nineteenth century. Most of the large and valuable sapphires, rubies, diamonds and emeralds are from the mines of India; the finest pearls re from the Persian Gulf and from the waters along the coasts of Ceylon. Gold and platinum are widely diffused throughout the Ural Mountains and the central plateaus. Silver is mined in Siberia. Copper and iron are widely distributed.

The vegetable products of Asia are as varied as its climates, temperatures and latitudes, we being able to find here many of the plants and trees belonging to the temperate, torrid and frigid zones. North of the 60th degree of latitude scarcely any vegetable growth is seen except birches, mosses and lichens, while the southern part of the continent is covered with a dense tropical vegetation. The palm, bamboo and banyan tree are abundant; and rice, cotton, sugar-cane, flax, jute, hemp, poppy and spices are cultivated on the plains and valleys. In Central Asia we find such vegetation as thrives best in the temperate zones. Vast forests of pine, larch, teak, maple and birch extend over the uplands of Siberia, while wheat, tea and rice are cultivated in Central, Eastern and Southeastern Asia. Western Asia produces tobacco, figs, dates, olives; and from this section also comes the famous Mocha coffee.

The animal life of Asia numbers in its catalogue nearly all the domestic animals of the earth, and most of them are native to it. The camel and elephant have been used as beasts of burden here from time immemorial. In the colder regions the bear, wolf, fox, buffalo and several species of wild cattle are common, and also many kinds of deer. In Southern Asia fierce animals and dangerous reptiles abound. Here are found in their native haunts, in the jungle, the rhinoceros, tapir, lion, tiger, hyena and jackal. Here are also the homes of the crocodile, python and the deadly cobra, which slays 20,000 people annually by its bite. The tropical forests are also alive with numerous monkeys and beautiful birds.

Asia is the cradle of the earliest civilization of mankind. And to this day more than one-half of the inhabitants of the earth live on that continent—in fact, fully one-half live in China and India alone. The history of this vast horde, divided into many governments, clans, and wandering tribes, is shrouded in much mystery, and, despite the research of antiquarians in modern times, except where the Asiatic has touched the ancient Jew, or later European in war, comparatively little is definitely known. A few of the powerful governments of ancient times, Syria, Assyria, Persia, Babylonia, etc., and those modern nations which have arisen on the sites they occupied, constitute about all that have a definite history yet given to the outside world.

The principal divisions, foreign possessions and populations of Asia at present are:

Countries.	Population.
Chinese Empire	402,680,000
Japan	41,090,000
Persia	7,653,600
Anam	14,000,000
Siam	6,000,000
Afghanistan	4,000,000
Beloochistan	600,000
Arabia	12,000,000
Independent states and tribes: Turkomans, Usbecks, Tartars, Caucasians, Malays, etc.	43,772,000
Foreign Possessions:	
Great Britain: British and Further India, Ceylon, Straits Settlements, Hong-Kong, Aden, etc.	150,800,000
France: Settlements on coasts of Malabar, Coromandel, etc. Cochin-China (Saigon)	1,300,000
Russia: Siberia, Ural provinces, Transcaucasus, etc.	9,200,000
Turkey: Asia-Minor, Mesopotamia, Kurdistan, Syria, etc.	16,500,000
Holland: Dutch East Indies, Java, Sumatra, Banca, etc.	23,000,000
United States: Philippine Islands,	8,500,000
Portugal: Goa, and Settlements in Hindostan Macao, etc. (China) Malay Archipelago	1,500,000
Total	882,595,600

China.

The Chinese Empire contains nearly four and one-half million square miles,

divided into China Proper, with 1,554,000; Manchuria, 380,000; Mongolia and Zungaria, 1,462,000; Thibet, 661,500, and Eastern Turkestan, with 580,000 square miles. This territory is bounded on the north and west by Asiatic Russia; on the south and west by British India, and on the southeast and east by Indo-China and the Pacific Ocean. The government is a despotic monarchy.

From the above table it will be seen that China, with an area only one-half larger than that of the United States, has a population almost equal to both the British and Russian Empires, with all their colonies and subject territories. In fact, if we leave out England's Asiatic subjects in India, China has more people than the Russian and British Empires, together with the United States, France, and Germany thrown in for good measure.

This vast and marvelous country, with its teeming millions, had in 1900 only 269 miles of railway, against North America's over 200,000 miles. With her boasted ancient civilization, China is the least progressive of all nations, and at the same time, perhaps, her people are the most universally energetic and frugal in habits. It would be wild to state what leaps and bounds this country must make in progress if the flood of Anglo-Saxon enterprise, education and business methods rolls in upon it as it now seems certain to do during the first quarter of the twentieth century. The food of the people consists chiefly of rice and fish, and it has already become proverbial in America that five Chinamen can live on what is required to support one white man. As throughout all Asia, there are practically no wagons or wagon-roads in China. Produce from the interior must be brought in wheelbarrows, on beasts of burden, and on the backs of laborers, to the rivers and seaboard.

The trade between China and Russia is now conducted by caravans; that with Great Britain, Australia, the Philippines, and the United States, by means of ships. Where rivers and canals (which are numerous) penetrate the country, freight and traveling is done by boats. The leading exports of China are tea, porcelain and pottery. The soil is exceedingly fertile, and agriculture is the chief occupation of the people. Sheep and cattle raising has latterly received considerable attention, and the wool market of the world has been affected by Chinese competition. Their latitude and climate enable them to put upon the market in crops and animals very similar products to those of the United States and Canada.

When the Chinese learn western methods of farming and stock-raising, as well as of business and manufacture, the world's commerce will feel the power of this multitudinous race. With the opening of China, which promises to come early in the new century, following the invasion of the European and American forces in 1900, and its troublous times with Russia in 1901, the investment of foreign capital becomes far more inviting than it has ever been in the past. The cheapness of labor there offers another inducement to capital, while the tractable and industrious nature of the Chinese native makes him a desirable apprentice in every branch of manufacturing.

THE RELIGION of the bulk of the Chinese is Buddhistic. The higher classes are Confucians. There are also estimated to be 1,000,000 Roman Catholic Christians and 50,000 Protestant Christians, and 30,000,000 Mohammedans in the Empire.

Japan.

The Empire of Japan, with its over 41,000,000 subjects, stands next to China in importance among the independent governments of Asia. In fact, in point of progress and development, both in its people and its resources, it is far ahead of any other Asiatic country. The kingdom consists entirely of islands (nearly 4,000 in number), embracing an area of nearly 150,000 square miles, containing mountains, streams, forests, and a well-cultivated soil, teeming with every variety of agricultural produce. The total length of the country is 2,450 miles and its area about 180 000 square miles, The coasts are indented by splendid harbors. The mountains are rich in minerals. The gold mines of Matsumai have long been celebrated. Silver, copper (the chief mineral), iron and sulphur abound; also several

varieties of precious stones. It possesses also ample deposits of coal. Among the most remarkable of its vegetable products is the varnish tree, with the juice of which the natives lacquer or "japan" their furniture. The camphor and vegetable-wax trees, the paper mulberry, the chestnut, oak, pine, beech, elm, maple, cypress, etc., are also noteworthy; the wagreen oak and the maple being the finest of all Japanese trees. Bamboos, palms, bananas, etc., also flourish. The tobacco-plant, tea-shrub, potato, rice, wheat, and other cereals, are all cultivated, —agriculture, upon which the people bestow great care and which they thoroughly understand, being their chief occupation; in fact, nothing can surpass their diligent and successful husbandry. The floral kingdom is rich, beautiful and varied. The fruits comprise those of the temperate zone, together with such semi-tropical varieties as the orange, lemon, and fig. The chief manufacturing industries are those of silk and cotton, lacquering, and porcelain, in which they are said to excel the Chinese; also lithochromo printing, engraving, etc. The leading commodities exported are copper, camphor, tea, silk, japanned ware, painted paper, etc. The internal trade of Japan is very extensive, and rigid regulations are in force to protect and encourage home industry. Foreign commerce was, until of quite recent date, completely excluded. In 1854, however, treaties were entered into with the United States and Great Britain, and in following years with others of the European States, by which the ports of Nagasaki, Kanagawa (Yokohama), Hiogo, Osaka-Nugata, and Hakodadi were thrown open to foreign traffic.

Since the China-Japanese War in 1895, the country has been practically as accessible to the commerce and enterprise of the world as that of any other civilized nation, and the manufacturing and business spirit of the Japs has won for themselves the title of "the Yankees of the East." The empire is politically subdivided into provinces, departments and districts, formerly governed by upwards of 200 princes called Daimios, each of whom held absolute power over his own jurisdiction; in 1870–71, these princes were made subordinate to the Mikado, or supreme ruler of the empire. This Mikado, or emperor, is considered of semi-divine origin, and was until quite recently invisible to the people at large. The Japanese army has latterly been reconstituted after the European manner. The navy consists of several splendid fighting ships, built in the United States and England. A railroad 517 miles in length connects the cities of Yeddo and Kioto, and many shorter lines have been and are being built to keep pace with the growing spirit of trade and progress which within the last decade of the nineteenth century became the great passion of the nation, collectively and individually. Telegraphic communication was opened first with China in 1870 and quickly extended to all other countries.

In view of the fact that Japan has concluded a victorious war with Russia, proving herself to be a world power to be reckoned with in 1905, it is hardly possible to realize that this nation has been considered as civilized for scarcely more than fifty years. In 1867 the first Japanese embassies were sent out to Europe. Since then her statesmen and students have gone officially to all foreign courts; and as students—some at the government's expense—large numbers of her young men have been sent to the leading institutions of learning in Europe and America, to study not only the lore of the books, but, more especially, to learn what the Westerner knows outside of books, in business and everywhere, that it might be taken back for "home improvement." The fruitage of this planting has been remarkable for its quickness and abundance. No other people of modern times, if, indeed, in any age, have advanced so rapidly in the threefold sense of material, educational and governmental progress as have the Japanese.

India.

The Empire of India, by which we mean nearly the whole of India, is subject to Great Britain, either absolutely or as tributary states. In area India is larger than all the Pacific states and territories, and it has (despite the terrible ravages of the famine of 1899 and 1900, which carried away millions) more than three times as many inhabitants

as the United States. Next to the Chinese Empire, India is the most populous government of the world. The country, as a whole, is remarkable for its high, snow-covered peaks, hot climate, and large population. Agriculture and stock-raising are the principal industries. Its low plains in the north are the most fertile in the world, the west and south being occupied by desert tracts.

India was settled by the Aryans about 1400 B. C. They were Brahmins, but unlike the Brahmins of the present time in their religious teaching and practices. Their language was the Sanskrit. The people are divided into castes. They believe in the transmigration of souls. Gautama or Buddha, about 500 B. C., introduced a form of religion which, after a long struggle with Brahmanism, was overcome in India and transplanted into China, where it has degenerated into a debasing form of idolatry. Queen Elizabeth chartered the East India Company in 1600 A. D. The vast empire, which had grown by its conquests, was transferred to the British Crown in 1858.

The exports are cotton, opium, rice, wheat, and jute. Cattle, camels, buffalos, sheep, and goats are numerous. The inhabitants subsist, principally, upon rice, fish, and tea.

Calcutta is the capital and the largest city in India, and the most important city in Asia. Bombay, on the western coast, and Madras, on the eastern, are important cities.

Queen Victoria was made the Empress of India in 1876, and Edward VII., her son and successor on the British throne, is its present Emperor.

Indo-China.

Farther India or Indo-China, comprising the kingdoms of Burmah, Siam, and Anam, Lower Cochin-China, Cambodia, and the Malay Peninsula, is noted for its long mountain ranges, hot, moist climate, fertile valleys, and dense forests and jungles. Here are the homes of large savage animals and many tribes of people scarcely removed from barbarism. The cultivation of rice, which forms the chief article of food for man, is the principal occupation of the people. Bangkok, the capital of Siam, is the largest city in Farther India. Mandalay, the capital of Burmah, and Singapore are other chief cities.

Persia.

Persia, *Afghanistan*, *and Beloochistan*, are remarkable for their desert tracts, forest-covered mountains, and fertile river valleys. Grain, sugar, fruits, indigo, and dates grow abundantly. Many inhabitants own large flocks of goats and sheep, and others are engaged in the manufacture of silk goods, shawls, rugs, and perfumery. Others do the caravan carrying trade. There are also many warlike tribes that rove over the deserts ostensibly as cattle-raisers, but their chief business is that of bandits.

Persia is especially noted for its extensive salt deserts. The inhabitants are a slow, easy-going people, hospitable and generous. All of the above countries are important chiefly for the fact that they lie between Russia and the Indian Ocean. Afghanistan is called "the gateway of India." Nearly all the people are Mohammedans, and their education is confined chiefly to learning portions of the Koran and scraps of poetry.

Turkey in Asia.

Turkey in Asia is a part of the Ottoman or Turkish Empire, the capital of which is Constantinople. In Eastern Asiatic Turkey flow the rivers famous in both sacred and profane history—the Tigris and Euphrates. In the northern part are remarkable forests, fertile valleys, and mountains. Among the latter, in Armenia, is the noted Mount Ararat, famed in the Bible as the resting-place of the ark after the Flood. Within Asiatic Turkey, also, is Damascus, a famous old city, with its grand old mosques. Damascus is the metropolis and centre of the caravan trade. It was here the famous Damascus steel of the ancients was made. Its chief manufactures now are saddles and silk goods.

Smyrna is the most important commercial city and seaport of Asiatic Turkey.

Tropical fruits, cotton, grain, and tobacco grow well in all the watered parts of the country. The people are chiefly Turks and Arabs, professing the Mohammedan

faith. The Armenians, however, are Christians, and have suffered a number of serious massacres for their religion, the last of great proportions being in 1896.

Arabia.

Arabia is sparsely settled, and has no general government. A part of it is under Egyptian rule. The rest of the country, though nominally shared among an uncertain number of petty states, is really ruled by sheiks, or chiefs, in small bodies, subject to the larger rulers called sultans.

The country is chiefly a hot, desert plateau, of about 1,500 miles in length and 800 average width, with oases scattered over the deserts, in which dates, grapes, and other fruits grow. It was in this desert that the Israelites wandered on their way to the Holy Land; and here, also, are the holy Mohammedan cities of Mecca and Medina, which yearly attract crowds of Moslem pilgrims.

Palestine.

Palestine, or the "Holy Land" of the Christians, and the "Promised Land" of the ancient Hebrew, adjoins Arabia. It is a mountainous and unfertile little country, containing the cities of Jerusalem and Bethlehem, the valleys of the Jordan, the Dead Sea, and the Sea of Galilee. The Dead Sea is the saltest body of water on earth. Its valley lies considerably below the level of the ocean. The Jordan flows into it, but there is no outlet. Palestine is under the dominion of the Turks, and has been for many centuries. To reclaim it religious zealots organized the Crusades, and hundreds of thousands of lives were sacrificed in the fruitless task.

OCEANIA

Oceania is separated from the continents in a manner to form it into a world of itself. It is composed of Australia and most of the islands of the Pacific. These islands are generally subject to volcanic action. The animal and vegetable life rank high; but the original people take a very low place in the scale of humanity. They have no record of history prior to the coming of the white man, before whom, and the progress of civilization, they are rapidly diminishing in numbers. Oceania may be divided into Maylasia, Micronesia, Australasia and Polynesia, with a total area of 4,211,093 square miles and a combined population of 39,200,000.

I. **Malaysia** is usually considered as part of Asia under the "East Indian Archipelago," but here it is included with Oceania. Chief islands—Sumatra, 179,290 square miles; population, 1884, 2,948,715. Java, 50,800 square miles; population, 22,500,000. Borneo, 284,918 square miles; population, 1,858,000. Celebes, 77,179 square miles; population, 933,823. Moluccas, 20,429 square miles; population, 352,580. Philippines, 114,219 square miles; population, 8,000,000. Lesser Dutch Islands, 42,489 square miles; population, 2,000,000. The total area of its islands is 769,324 square miles, and the population 34,661,000.

II. **Micronesia** includes the Caroline and Pelew Islands, 1,450 square miles; population, 36,000. Mariannes, 443 square miles; population 8,665. Gilbert Islands, 165 square miles; population, 35,200. Marshall Islands, 154 square miles; population, 11,600. Total area, 1,322 square miles; population, 91,465.

III. **Australasia** comprises the great islands of Australia, Tasmania, New Zealand, New Guinea (which five are treated individually hereafter). New Caledonia and Loyalty Islands, 7,644 square miles; population, 68,400. Solomon Islands, etc., 23,546 square miles; population, 260,850. Total area, 3,430,234 square miles; population, 4,989,000.

IV. **Polynesia**—Chief groups, Friendly Islands, 384 square miles; population, 25,000; Samoa Islands, 1,073 square miles; population, 36,800. Society Islands, 636 square miles; population, 16,300. Marquesas, 491 square miles; population, 5,776. Sandwich Islands, 6,558 square miles; population, 57,985. Total area, 10,313 square miles; population, 179,550.

FLAGS OF ALL NATIONS

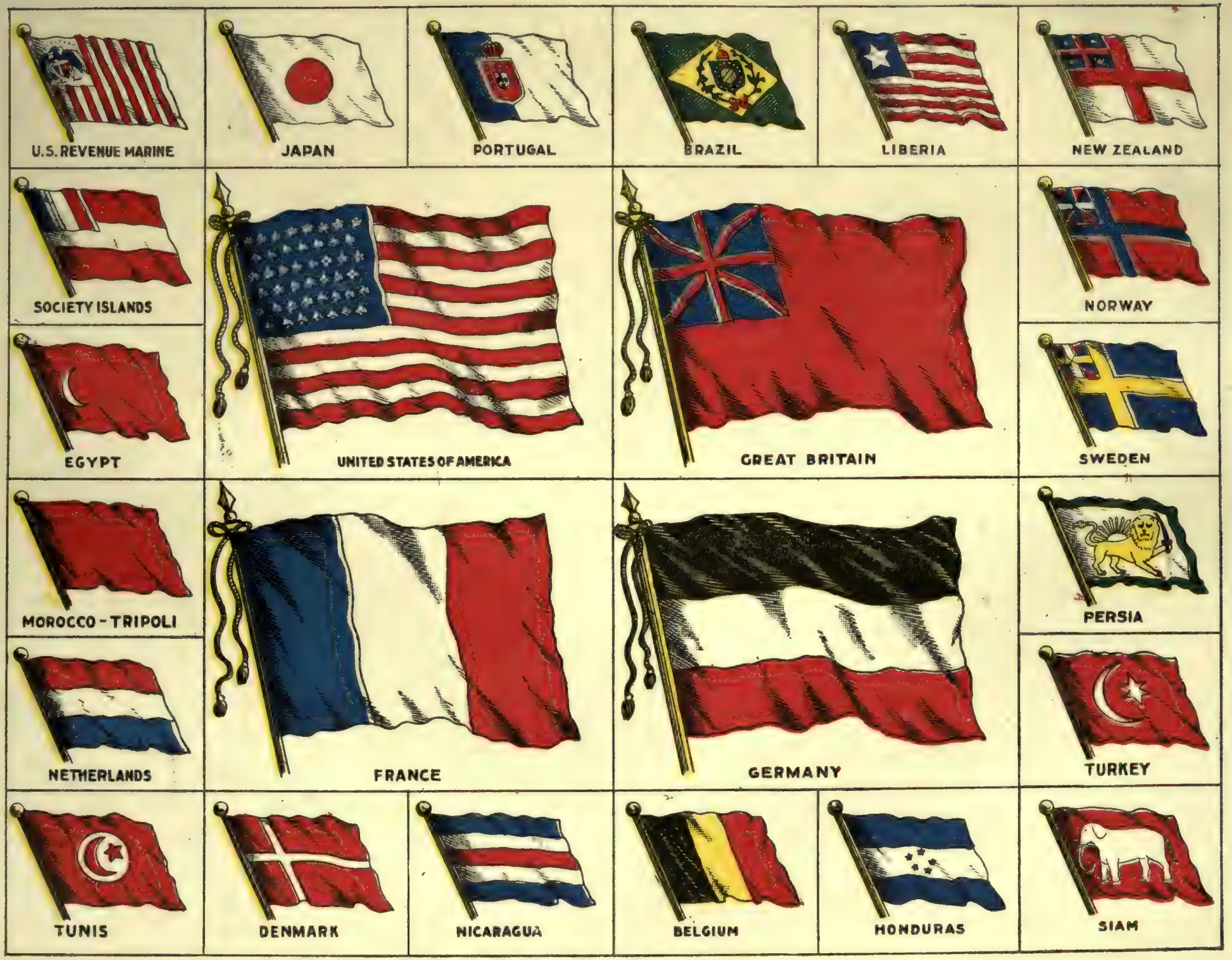

U.S. REVENUE MARINE
JAPAN
PORTUGAL
BRAZIL
LIBERIA
NEW ZEALAND
SOCIETY ISLANDS
UNITED STATES OF AMERICA
GREAT BRITAIN
NORWAY
EGYPT
SWEDEN
MOROCCO - TRIPOLI
FRANCE
GERMANY
PERSIA
NETHERLANDS
TURKEY
TUNIS
DENMARK
NICARAGUA
BELGIUM
HONDURAS
SIAM

TABLE OF EUROPEAN POSSESSIONS.

Country	Area in Square Miles	Population
British	3,160,380	3,223,041
Dutch	718,800	28,500,000
Spanish	116,250	5,680,665
German	88,650	343,600
French	9,104	85,753
Portuguese	6,290	300,000

Australia.

Australia, the largest of the islands of the world, lies wholly south of the equator, and is really a continent within itself, its greatest length, from Cape Byron to Steepe Point, being 2,400 miles, and its greatest breadth, from Cape York to Cape Wilson, 2,000 miles. The island is divided into the following provinces: Victoria, New South Wales, Queensland, South Australia, and West Australia (since the Federation Westralia).

Surface.—The surface is generally a level plateau, with a mean elevation of 1,180 feet above the sea-level. The interior, especially in the west, consists largely of sandy and stony desert. The mountainous region is almost exclusively confined to the eastern and southeastern coasts, comprised in a belt about 150 miles wide. The only great river is the Murray, 1,550 miles long, and with its tributaries draining an area of 270,000 square miles. A characteristic feature of the continent is also its inland salt lakes, the principal ones of this character being Lakes Eyre, Gairdner, Amadeus and Torrens. A part of Queensland and North Australia lie in the torrid zone, and have a mean temperature of 78 degrees. Extremes of cold and heat prevail in the temperate zone.

Vegetation.—The vegetation of the continent is remarkable. Several varieties of trees not found elsewhere grow here, and, instead of being in dense forests, are scattered about like parks. The foliage of most of the shrubs and trees is evergreen. The animal life of the island is also unlike that of any other part of the world. There are no beasts of prey; the swans are black instead of white, and a fish, called the climbing perch, ascends trees by the aid of its fins and catches insects. The island has practically no singing birds.

Australia has been called the land of wool and gold. It produces more wool than any other country, and comes next to the United States and the now famous Klondike region in its production of gold.

New South Wales is the oldest of the Australian colonies, with an area of 310,700 square miles, and a population of about 1,500,000.

Victoria.—The population is estimated at 1,250,000, with an area of 87,884 square miles.

Queensland.—The population approximates 500,000, with an area of 668,224 square miles.

South Australia embraces 903,690 square miles, with a population of about 400,000. The name of this province would imply that the colony is confined to the south of the continent; on the contrary, it extends to the farthest north, and is popularly known under the name of the Northern Territory.

Western Australia (or Westralia) is the largest of the Australian states, including all that portion of the continent situated to the westward of 129 degrees east longitude. Its area is 978,300 square miles. Its population is very sparse, numbering only about 40,000.

Government.—Prior to 1901, the government of all the colonies comprised the Executive, consisting of a governor appointed by the British Crown, assisted by a cabinet of ministers, and the Legislative, consisting of a Parliament and a Legislative Assembly. The number of the Executive Council of Ministers varied in the different provinces, as did also the number of members in the two legislative bodies.

The Australian Federation.—On the first day of the year 1901 all of the colonies entered a federation, under the title of "The Commonwealth of Australia," composed of six states, five of which are above mentioned, occupying the mainland of Australia, the sixth being the island of Tasmania, which lies off the southern end of the great island, separated from it only by a narrow strait. As will be seen by the above statistics, two of these states, Westralia and South Australia, are about four times as large as the State of Texas. The Australian organization is the first federation of British

colonies to be governed under a constitution entirely framed by its own people. This constitution more nearly resembles that of the United States of America than any other, but it has some important differences. The Governor-General is appointed from time to time by the British Cabinet, to represent the King, but he will be guided entirely by the advice of a Cabinet of Ministry, consisting of members of the Federal Parliament, who are able to command a majority of the votes in the Chambers, particularly the Chamber of Representatives, which controls the finances of the commonwealth. The legislative power rests with the Parliament, consisting of two chambers, denoted respectively, the *Senate*, with thirty-six members, six from each state, without reference to population; and the *Representative Chamber*, consisting of seventy-two members, elected for three years, by the people of the states, in proportion to their population. The Senators are elected by the people of their respective states (not, as in America, by the State Legislature), and they hold office for six years.

Religion in Australia (with the exception of the aborigines, who still practice fetichism to a certain extent, and Judaism, which follows the Semitic race into all countries), is entirely Christian, divided between the Protestant sect and the Roman Catholic, in the proportion of about five to two.

Education is fostered with the characteristic industry of the English-speaking colonists everywhere. Public schools prevail throughout Australia. There are large universities at both Sidney and Melbourne. In some of the provinces education is made compulsory. Melbourne is the commercial centre of Australia and the largest city in Oceania. Sidney is the capital and metropolis of New South Wales. Brisbane is the capital of Queensland, Adelaide of South Australia, and Perth of Western Australia.

Tasmania.

This island forms the sixth state of the Australian federation. It is located in the South Pacific Ocean, situated at the southeastern extremity of the Australian mainland, from which it is separated by Bass Strait, about 150 miles wide. **Area, 26,215** square miles. Population, estimated, 145,000 (aborigines quite extinct). Religion, Protestants, 102,551; Roman Catholics, 30,516; Jews, 316. Government administered as in other British colonies. Education, compulsory. There are sixteen superior schools or colleges.

New Zealand.

Situated about 1,200 miles to the southeast of Australia, this is also a British colony, consisting of a group of three principal islands, called respectively, the North, South, and Stewart Islands, and several islets, mostly uninhabited. Area, 104,403 square miles. Population, over 600,000 (exclusive of 40,000 Maoris). Religion, Protestants, 461,340; Roman Catholics, 79,020; Jews, 1,550. Government, administered as in Australia and other British colonies. Education, compulsory, secular and free. By the latest available statistics there were three colleges affiliated with the University of New Zealand; twenty-three grammar schools; 288 private schools; and 1,054 state schools with 105,234 scholars.

New Guinea.

Next to Australia, this is the largest island in the world. Its greatest length is 1,490 miles and its maximum breadth is 430 miles. The area is estimated at 311,580 square miles, with a total population of 2,500,000. All the land to the west of 141 degrees east longitude is claimed by the Dutch. East of this New Guinea has been divided between Britain and Germany, the northern portion belonging to Germany and the southern part to Britain.

British New Guinea has an area of 86,457 square miles and a population of 135,000. The government is administered by the Deputy Commissioner, who resides at Port Moresby, the only port of entry for goods.

German New Guinea, comprising 95,653 square miles and a population of 325,000, lies to the east of the Dutch and north of the British possessions. This territory was taken possession of by Germany in 1885 and called Kaiser Wilhelm's Land. Afterward the New Britain Islands, and the islands of

Bougainville, Choiseul and Isabel, in the Solomon group, were annexed under the name of Bismarck Archipelago.

The seat of administration is at Finschhaven, where the Governor resides.

The Fiji Islands.

The Fiji or Viti Archipelago is a Crown Colony of Great Britain, and comprises about 225 islands and islets, nearly eighty of which are inhabited. Area, 8,048 square miles. Population, 130,000, nearly all natives. Religion, Protestants, 105,000; Catholics, 9,500. Education, a few public schools, state-supported; scholars are also taught by the native teachers of the Wesleyan Mission. The Roman Catholic Missions conduct a number of native schools with large attendance. The chief exports are sugar, copra and cotton.

Malaysia, Micronesia, and Polynesia.

For the various islands comprising these groups, with statistics concerning the same, see the beginning of this article. The most important are also further mentioned under the treatment of the respective governments to which they are subject.

THE CONTINENT OF AFRICA

Africa forms the vast southwestern peninsula of the old world, being joined to Asia by the narrow isthmus of Suez. This continent, next to Asia, is the largest of the continents of the earth, and, next to Asia, the home of the earliest civilization, but at the beginning of the twentieth century was the most uncivilized of all the continents of the earth.

In area Africa covers about 11,000,000 square miles, which is three times that of Europe, and one-fifth the land surface of the globe. Its extreme length is 5,000 miles, its extreme width 4,600. No other division of the earth has such a rounded and compact outline as Africa. Access to the interior is rendered difficult by the general absence of gulfs and large inlets, and the total absence of roads. The coast line measures 16,000 miles; hence, the continent contains 720 square miles of surface to each mile of coast.

Population.—No definite figures exist for the larger part of Africa's population. It is estimated to be about 200,000,000 souls, or over one-seventh of the inhabitants of the world.

Surface.—The interior of the continent is a plateau, almost completely surrounded by mountains. This plateau is lower in the north than in the south and east, its average elevation in the north being about 1,500 feet, and in the south about 4,000 feet above the level of the sea. Nearly one-third of the entire area of the continent is occupied by deserts, the Sahara being the greatest, and this is a desert, not because it has a sandy surface, but from lack of water. Its soil, if it could be irrigated, would, doubtless, be highly productive. This great desert occupies an area about the size of the United States.

Rivers.—Africa has many great rivers, the principal ones being the Nile, the Congo, the Niger, and the Zambeze, but because of cataracts in them, and lack of harbors about their mouths, these great rivers are commercially unimportant. The Nile is the most important of the African rivers. It brings down rich soil from the mountains, and annually overflows its banks, thus transforming its otherwise desert valley into the most fertile region of the world. Contrary to the usual rule, this great river diminishes in size as it approaches the sea, which is owing to the large amount of water used in irrigation, and which evaporates during its course. For the last several hundred miles before it reaches the sea it has no tributaries.

Lakes.—The lakes of Africa are next in size to those of North America. Lake Victoria is thought to exceed Lake Superior in area. Lake Tchad, during the rainy season, is even larger than Victoria.

Climate.—Throughout a large part of Africa there are but two seasons. Owing to its position in the torrid zone, and to the large number of deserts, it is the hottest of the continents. In Nubia and Upper

Egypt eggs may be roasted in the sand. During the daytime the Soudan is the warmest spot in Africa, but at night it cools off so rapidly that water sometimes freezes. The climate of the highland countries is delightful. In Egypt it is mild and delicious. The clearness of the atmosphere exceeds everything of the kind known in other lands, while the dryness of the air preserves natural objects from decay, and so hastens evaporation that travelers are obliged to oil their faces and hands to prevent the cracking of the skin. Along the coast regions, however, within the tropics, the climate is deadly.

Vegetation.—The agricultural products of Africa are tropical or semi-tropical, except upon the highlands. There are no large forests in the south or in the north of the continent, but along the low coasts, the streams and the lakes the forests are dense. In the interior are park-like regions of stately trees, without any undergrowth. Again, there are broad, treeless steppes, covered with grass and flowering plants several feet high.

Minerals.—In mineral products Africa is among the richest of the continents. It is claimed by some historians that the famous gold of Ophir and the rubies and gems sought after and collected by King Solomon came from the mines of Africa. The richest diamond mines of the world are located at Kimberley, South Africa, and the richest gold mines on earth are those of Johannesburg, in the Transvaal country.

Inhabitants.—Three distinct races now represent the population of Africa, the Caucasian, the Negro, and the Malay. The Negro is found principally in the central part, north and south of the equator. In the Sahara and coast countries, from the Straits of Gibraltar to Cape Guardafui, the same race prevails, the Moors, Arabs, Berbers, and Egyptians belonging to the Caucasian race. Caucasians also dominate South Africa, in Cape Colony, and the Orange Free State and Transvaal countries, though the Negro population in these sections far outnumbers the white.

Slave Trade.—It was in Central Africa, or the heart of Africa, that the slave trade of the past was conducted. It was carried on mostly by the Arabs, who established encampments in the interior, and kept up communication with wealthy traders on the coast by means of caravans. On slight pretext quarrels were picked with the natives, their huts were burned, and they were carried off and sold as slaves.

History.—The history of Africa, until within very recent times, is confined to the northern part. In ancient times this section was the site of a high civilization, while other portions have always been hid in gross darkness, and until very recently regarded with superstitious awe. It was in Northern Africa that Carthage, the Phœnician colony, became the head of a powerful empire, but was finally conquered by the Romans. In the seventeenth century the Arabs invaded Northern Africa. The Moors, expelled from Spain, came later, settled off the coast, and began a course of piracy against Christian nations. It was in their wars with the Moors that the French, in trying to protect their vessels, gained possession of Algiers. In 1815 the United States had considerable trouble with the piratical Barbary States.

Development.—The development of Africa has recently progressed with wonderful rapidity. Within the past quarter of a century commercial enterprises have moved far up the Congo. Dutch, French, and Belgian companies have established many trading-posts on the upper river, between Stanley Pools and Stanley Falls, a caravan route being established to transport goods past the cataracts. But the most marvelous development of the country must depend, not upon river transportation, but upon railroads. It sounds marvelous to speak of a railroad through Central Africa from Cape Colony on the south to the Mediterranean Sea on the north, but such a gigantic enterprise is now in progress. The road has been built a long part of the way, and it is confidently believed that before the first quarter of the twentieth century shall have passed it will be but a matter of one or two weeks to pass from Cape Town to Cairo, a distance of over 5,000 miles, or from Cape Guardafui on the east to Cape Verde on the west, a distance of 4,600 miles. In fact, the eyes of the commercial world are looking to-day for

the startling developments of the next century in Asia and Africa, the oldest and the least civilized of all the continents of the world.

England, almost unmolested, dominates Africa, and Russia, now superior in, is struggling to dominate Asia, with all the other European powers and America watching her actions with jealous eyes, and with no small inclination to divide the spoils with the Muscovite Empire.

Governments of South Africa.—The principal states of South Africa are as follows:

Cape Colony, under British control. Executive, the Governor and Executive Council; legislative, the Legislative Council and House of Assembly of seventy-four members.

Natal, also under British control. Government administered by a Governor, assisted by an Executive Council of thirty members.

The South African Republic, until 1900 independent. Now under British control. Government not yet organized.

The Orange Free State, under British control. Government not yet organized.

The two above-named Dutch Republics, prior to the British conquest of 1900 and 1901, were independent in their internal affairs, but Great Britain claimed a suzerainty in so far as dealing with outside nations was concerned. In the South African Republic the government consisted of the executive, vested in the President, and the legislative, consisting of the Volksraad of forty-four members, and the suzerain, her Majesty Queen Victoria. In the Orange Free State the same order prevailed, except that the Volksraad had fifty-six members.

Central Africa.

The Congo Free State, with an area of 800,000 square miles and a population of 24,000,000, was constituted in 1885, and its status defined by the International Conference held at Berlin. It was declared neutral and free to the trade of all nations, and has been recognized by all the leading countries of the world. The state was placed under the immediate sovereignty of the King of the Belgians, and is governed by an Administrator-General, who resides at Boma, the capital.

Eastern Equatorial Africa is controlled by Germany and England, under the arrangements of the commission appointed by these two nations in 1886. It embraces, including Zanzibar, and the German and English protectorates, a little over 250,000 square miles.

The Portuguese colonies, south of the equator, are named respectively Angola and Mozambique, the former with an area of 115,000 square miles and a population of 1,000,000, the latter with an area of 80,000 square miles and a population of 600,000.

The French colonies, sometimes called Equatorial France, comprise the Gaboon and Ogowe-Congo regions, which, as divided by the Berlin Conference, have an area of 174,000 square miles, with about 1,700,000 inhabitants.

The German colonies, otherwise known as Luderitzland, lie on the southwest coast, and embrace an area of 200,000 square miles, with about 236,000 inhabitants, comprising all the land between the Cunene and Orange rivers, with the exception of Walfish Bay.

Central Africa also includes the territory of Soudan and a number of colonial possessions on the Guinea and Zanzibar coasts. All of these countries are populated almost entirely by negroes.

Liberia, or the Land of Liberty, is a republic, founded as a home for liberated slaves from the United States. The capital, Monrovia, is the principal city, and was named in honor of President Monroe of the United States.

Sierra Leone, meaning the Negro's Paradise, is a British colony, settled largely by negroes liberated from slave-ships.

Ashantee and Dahomey are inhabited by native tribes noted for their cruelty.

Zanzibar includes a long strip of the Atlantic coast, together with a number of islands, inside of which Germany and Great Britain obtained the foothold above referred to, the ostensible object of this move being to prevent the Arabs from carrying on the slave-trade.

All of Central Africa is regarded as an impossible place for the Caucasian race to live for any length of time.

Northern Africa.

Northern Africa includes the Barbary States of Tripoli, Tunis, Algeria, and Morocco, the inhabitants of which are Moors, Arabs, and Berbers, an ignorant and warlike people. Morocco is the largest of the Barbary States, and is subject to Turkey. Algeria and Tunis are French possessions. Tripoli is a Turkish province.

Egypt, the most important country of Northern Africa, with an area of 494,000 square miles and a population of about 7,000,000, is the oldest of civilized nations existing to-day with a history. It was conquered successively by the Persians, Grecians, Romans, and Saracens, and is now under the control of Great Britain. It is noted for its massive ruins of ancient Egyptian architecture, the Pyramids being probably the oldest monuments in the world. These and the Sphinx are the wonders of Egypt sought by travelers.

Cairo, with 570,000 inhabitants, is the capital of Egypt. Alexandria is its chief seaport, and has a large European population.

AMERICA—THE NEW WORLD

North and South America constitute what is known as the "New World." They are really one continent connected by the Isthmus of Panama, but are usually considered as two. The New World was first discovered to modern civilization in 985 by the Scandinavians, but little heed was given their reports by the world, and a silence of half a millenium followed, without a record, until Columbus landed on the West Indies in 1492. Five years later Cabot discovered Newfoundland, and the next year, 1498, the two Cabots (John and Sebastian) explored the Atlantic coast for a considerable distance. In 1499 Amerigo Vespucci voyaged on the tracks of Columbus, and, returning to Spain, wrote an account of his discoveries. After his name the new world was called *America*.

In 1512 Ponce de Leon, the Spanish governor of Porto Rico, discovered Florida. The next year Balboa marched over the narrow land of Central America and discovered the Pacific Ocean. Eight years later, 1521, Cortez invaded and conquered Mexico. In 1534 the French under Cartier explored the St. Lawrence as far as Quebec and Montreal, and ten years later the Spaniards under De Soto marched for months through the forests of the territory now covered by the Southern States and discovered the Mississippi River.

Thus, less than four hundred years ago, the Continent of America, now the most progressive and prosperous, and with the most hopeful prospects, generally speaking, of all the continents of the earth, was just beginning to be known to the world.

Though the present city, St. Augustine, Florida, was founded in 1565, it amounted to nothing more than a trading-post for a long time. The first real settlement was attempted at Roanoke Island in 1585, but failed. The next was at Jamestown, Va., in 1607, and in 1614 the Dutch started a permanent settlement at New Amsterdam (now New York). Six years later, 1620, the Puritans landed at Plymouth Rock. In 1527 the Swedes and Finns settled along the Delaware; 1636 Roger Williams settled in Rhode Island; 1665 the Clarendon Colony was planted in North Carolina; 1670 the Carteret Colony founded Old Charleston, S. C.; and in 1682 William Penn's Colony settled in Pennsylvania.

At the beginning of the year 1700 all these colonies had a combined population of less than half a million people. In the whole New World, North and South America, there were less than one and one-half million people of Caucasian blood in an area of nearly sixteen million square miles. In the year 1900 this territory contained approximately 135,000,000 souls, over 100,000,000 of them being of the white man's race.

The history of any independent government in America is scarcely more than a century old. Spain, France and England owned the New World one hundred and twenty-five years ago. In 1781 the surrender of Cornwallis at Yorktown, followed

by the treaty of peace in 1783, sealed the Declaration of Independence of 1776. The Constitution of the United States of America was adopted in 1787, ratified by eleven States in 1788 and followed shortly by two others. In 1789 George Washington was made the first President of the first republic of America, which has since become the governmental light of the world. At present all of North America south of the Dominion of Canada, all of Central America (except British Honduras and Balize), and all of South America (except the small space covered by English, Dutch and French Guiana), are under republican form of government, modeled after that of the United States. There are twenty republics on the American continent, as follows:

	Area Sq. Miles	Population	Capital City
North America			
The United States	3,602,990	76,295,220	Washington
Mexico	667,316	12,619,949	City of Mexico
Central America and West Indies	46,774	1,535,632	New Gautemala
Gautemala	42,658	420,000	Tegucigalpa
Honduras	7,222	800,500	San Salvador
Salvador	51,660	420,000	Nicaragua
Nicaragua	19,985	309,683	San Jose
Costa Rica	41,655	1,600,000	Havana
Cuba	46,744	1,211,625	Port au Prince
Hayti	20,596	600,000	San Domingo
San Domingo			
South America			
Brazil	3,219,000	18,000,000	Rio Janeiro
Venezuela	566,159	2,444,816	Caracas
U. S. of Columbia	331,420	4,600,000	Bogota
Ecuador	144,000	1,300,000	Quito
Peru	405,010	3,000,000	Lima
Bolivia	472,000	2,500,000	Lapaz
Chili	256,860	3,110,085	Santiago
Argentine Republic	1,095,013	4,044,911	Buenos Ayres
Paraguay	145,000	600,000	Asuncion
Uruyguay	72,112	840,725	Montevideo

NORTH AMERICA

North America, the northern continent of the western hemisphere, forms a large part of the New World. It is directly opposite the great mass of the Old World. Next to Asia and Africa, it is the largest of the continents, with an area of 9,300,000 square miles, with a total length of 5,000 and a breadth of 3,000 miles. It extends from the Arctics to the tropics, hence has a varied climate. Hudson Strait is bridged with ice for ten months of the year, Greenland and Alaska are the home of the earth's greatest glaciers of never-melting ice, while Southern California, Florida, the West Indies and Mexico are "lands of perpetual summer, where flowers never cease to bloom."

The surface of the continent consists of a primary highland in the west, a secondary highland in the east and a great central plain. The primary highlands include the western two-thirds of the continent; the Rocky Mountains are the apex or comb of this elevation, and form the principal watershed of the continent.

The Rocky Mountains are magnificently grand, wild and broken. The lowest pass across them is one and one-half miles above the sea. The first view of them from a distance is a faint outline against the sky. This outline gradually becomes more distinct until it appears like a vast irregular wall supporting the heavens; nearer still, the wall takes the form of a ruined fortress battered and torn by artillery. This outer wall passed, we enter mountain valleys bounded on all sides by snow-crowned peaks which glitter and glisten in the sunshine. Cliffs rise in places like walls made of bright red-colored, brick-shaped rocks of immense size piled one above another. Then come deep chasms of sandy pools. A feeling of loneliness and littleness creeps over the traveler—everything is so grand and imposing—as he looks and marvels in silence at the mountains rolled up in all shapes around, amid a solitude that is gloriously sublime. *The Great Basin* of the Rockies is formed by the sides of the ranges sloping together. This region is a desert which has no outlet, its streams generally being lost in the sand. Death Valley, within the Great Basin, is so called from the number of persons who have perished there from thirst. *Colorado Plateau*, drained by the Colorado River, has many deep canons, the grand canon of the Colorado being the most celebrated. The entire region is like some fabled land of old. Many of the peaks on the ranges are nearly three miles above the level of the sea. Along the 40th parallel are twenty-five peaks of more than two miles in height. Mt. St. Elias

with 19,500 feet, and Mt. McKinley 20,460, both in Alaska, are the highest peaks in North America.

The Secondary Highlands occupy the eastern side of the continent, and are formed by the Laurentide Mountains in Labrador, and the Blue Ridge, Alleghany, and Cumberland ranges of mountains. The Alleghany and Cumberland ranges are noted for their rich mines of coal and iron. The highest point of the secondary highlands is less than 7,000 feet, and its height averages about 2,000 feet.

The Great Central Plain, which lies between the eastern and western highlands just described, comprises nearly all the lowlands of North America, and is one of the largest valleys in the world. It is drained by the Mississippi River. This plain is the greatest agricultural region of the world, and it is also rich in minerals.

The navigable rivers of North America surpass, in number and importance, those of any other continent. The Mississippi is the principal river, which, with its chief tributary, the Missouri, admits of the longest continuous navigation of any river of the earth. Of this and the other rivers of North America, the following table is appended:

River.	Length.	Area of Basin.
Mississippi with Missouri	4,500	982,400
Mackenzie	2,800	580,000
St. Lawrence	2,384	480,000
Rio Grande	1,800	240,000
Saskatchewan	1,515	478,000
Columbia	1,020	298,000
Colorado	1,000	257,000
Yukon	2,000	200,000

North American Lakes are the most important of the earth. The five Great Lakes are estimated to contain one-half of all the fresh water in the world; and they are so connected by rivers and canals as to form an immense system of commerce, of incalculable service to the United States and Canada. *Lake Superior* is as large as all the New England States. *Lake Erie* is shallow and much disturbed by storms. *Great Salt Lake* has the densest (most buoyant) water known, except the Dead Sea. It has four considerable streams running into it, but no outlet. Following is a table of the principal lakes of North America:

Lake.	Area.	Elevation.	Depth in Feet.
Lake Superior	31,500	602	688
Lake Michigan	23,150	579	600
Lake Huron	23,100	578	600
Lake Erie	7,800	573	84
Lake Ontario	6,900	247	500
Great Salt Lake	2,000	4,200	
Lake Winnipeg	9,000	628	

The vegetable life of North America is as varied as its climate. In the extreme north, where the cold is intense and there is little moisture, vegetation is scant and stunted. There is here a treeless zone called the "barrens." Further south is a broad belt of pine and fir forests, extending across the continent. *The Central Belt* contains the agricultural lands of the continent. The Mississippi Valley has been called the "Garden of the World." *The Southern Belt* is the region of palms, tropical fruits, dye-woods, sugar-cane, and live-oak. Cotton is king in one section, corn, wheat, and other grains in another.

Animal life is also at its best in North America. The wealth of moisture and abundance of vegetation encourages herbiverous life, and flesh-eating animals do not predominate as in the Old World. Animals of the Arctic belt,—beaver, walrus, seal, and whale; of the central belt, bear, deer, panther, wolf, elk, goose, duck, bison; and of the southern belt, monkeys, alligators, parrots, lizards, and other tropical animals and birds of rich plumage. The puma, the American lion, replaces on this continent the lion and tiger of Asia, and the turkey and some other birds are peculiar to America.

The people of North America are a mixture made up of the best blood of Caucasian nations, the English, Scotch, Irish and German type predominating in the United States and Canada, except in the Province of Quebec, where the French stock prevails. In Mexico, as in Central America, the West Indies and South America, Spanish blood, pure and mixed with the negro, predominates. The Indians were the aborigines of the New World, but, while certain historians claim there are as many still living in the United States and Canada as

were here when Columbus came, it is their nature to retire before civilization, and to the casual observer they have comparatively passed from the land. Unlike the negro, they have not been inclined to mix with the white man. The Spaniards tried to enslave them in the West Indies and South America, but in such cases the Indian suffered extermination rather than submit, and the negro was imported to supply his place. The presence of the millions of blacks in America is wholly due to the wicked system of slavery which introduced him, and to his tractable and docile nature, which submitted to what the red man would not endure.

The typical American of the future will doubtless arise from the amalgamation of the good and the bad of the nationalities and races mentioned above.

Countries of North America.

North America includes British America, the United States, Mexico, Central America and the West Indies. The boundary line between the United States and Canada is marked by a row of iron pillars, earth mounds, cairns and red timber posts to show the division. The Rio Grande River for part of the way and posts mark its line of division from Mexico.

Danish America includes Greenland and Iceland. Greenland is a large wedge-shaped island or series of islands surrounded by an icy sea. Its interior is a desolate expanse of glacier and snow. The principal settlements of Greenland are on the western coast. Most of the inhabitants are Esquimaux, with a few hundred Europeans, chiefly Danes. Barley and a few vegetables ripen on the southwestern coast. Seal skin, whale oil, eiderdown and furs are exported. In northern Greenland the sun is below the horizon seventy-nine days—a long night. Their summer days are sometimes warm, but snowstorms come even in July.

Iceland might more properly be called "Fireland." It is evidently of volcanic origin. The greater part is uninhabited, being covered with lava-beds, glacier-fields and mountains. There are also hundreds of hot springs and geysers. The inhabitants are chiefly of Scandinavian descent, intelligent and well educated. The Protestant religion prevails. Sheep and cattle are raised in the southern part of the islands. The Governor is appointed by the King of Denmark.

British America

comprises the Dominion of Canada, Newfoundland and Labrador, and embraces all of North America north of the United States except the Danish Islands, Greenland and Iceland, and embraces a total area of 3,700,000 square miles.

Newfoundland is the only one of the British provinces in North America which has not joined the federation forming the Dominion of Canada. Its total area is 42,000 square miles, with a population of 210,000. Newfoundland lies nearer Europe than any other part of America. Its interior has not yet been fully explored. It is noted for its dense fogs and bold, rocky cliffs.

St. John, the capital is the only important town with a fine harbor. Fishing is the principal industry.

Religiously the inhabitants are divided as follows: Church of England, 72,000; Roman Catholics, 75,000; Wesleyans 49,000.

The Government is administered by the Governor, appointed by the Crown, assisted by an Executive Council (not exceeding seven members), a Legislative Council (not exceeding fifteen members), and a House of Assembly consisting of thirty-six Representatives.

Labrador is a vast wilderness uninhabited by civilized man, with the exception of a few settlements along the coast where fishermen from Canada and the United States swarm in summer.

The Dominion of Canada.

Canada lies immediately north of the United States of America, and has a population roundly estimated at 5,000,000 inhabitants. Before the Revolutionary struggle which gave the United States independence, France and England waged a long war for supremacy in the New World. England triumphed in the victory of Wolfe over Montcalm on the Heights of Abraham, and Canada has since been British territory. The provinces were governed independently until 1867, when, through the instrumentality of Sir John Macdonald, Sir John

Thompson, and others, a Confederation was effected, finally uniting all the provinces with the exception of Newfoundland.

The Dominion of Canada has an area of 3,653,946 (including the Hudson Bay) square miles, and comprises one-sixteenth of the land surface of the globe. It is the largest of all the British possessions, Australia, the next in size, containing 2,944,628 square miles. The government of Canada is Federal, centered at Ottawa, which city is the capital of the Dominion, while the provinces and the northwest territories have their respective local legislatures. The head of the Federal Government is the Governor-General, appointed by the King of Great Britain, and holding office for five years, his salary ($50,000 per annum) being paid by the Dominion Government.

The lieutenant-governors of the several provinces are appointed by the Federal Government for a term of five years. The legislatures are elected by the people of each province. The highest court in the Dominion is the Supreme Court, composed of a chief justice and five judges, each of whom receive a salary of $7,000 per annum, except the chief justice, who is paid an additional $1,000.

The salary of each member of the Dominion Cabinet holding a portfolio is $7,000 per annum, except the Premier, who receives $8,000.

The following list of officers constitute the Ministry or Cabinet: Premier and President of the Privy Council, Secretary of State, Minister of Trade and Commerce, Minister of Justice, Minister of Marine and Fisheries, Minister of Militia and Defence, Postmaster-General, Minister of Agriculture, Minister of Public Works, Minister of Finance, Minister of Railways and Canals, Minister of the Interior, Minister of Customs, Minister of Inland Revenue.

Legislative Bodies.—The Senate (Dominion Parliament) is composed of eighty members and the Speaker, whose salary is $4,000. Each senator receives a sessional indemnity of $1,000 and mileage. The House of Commons is composed of 213 members. Each member of the House receives a sessional indemnity of $1,000 and mileage. The members of the House of Commons are elected under the several provincial franchises, in accordance with a Federal act passed in 1898. The senators are appointed for life by the Crown on the nomination of the Governor-in-Council.

AREA, POPULATION AND SEATS OF GOVERNMENT OF THE PROVINCES

Provinces	Area Square Miles	Population	Seats of Government
Alberta	100,000	25,278	Regina
Assiniboia	90,340	30,374	Regina
Athabaska	251,300	....	Regina
British Columbia	383,300	98,173	Victoria
Manitoba	73,956	152,506	Winnipeg
New Brunswick	28,200	321,270	Fredericton
Nova Scotia	20,600	450,523	Halifax
Ontario	222,000	2,114,475	Toronto
Prince Edward Island	2,000	109,088	Charlottetown
Quebec	347,350	1,488,586	Quebec
Saskatchewan	114,000	11,146	Regina
Mackenzie, Ungava and Franklin	1,019,200	31,462	Regina
Yukon	198,300		
Keewatin	756,000		
Great Lakes and Rivers	47,400		
Total	3,653,946	4,823,875	

Canada has a magnificent canal system. The Welland Canal, between Lakes Erie and Ontario, and the Rideau Canal, between Lake Ontario and Ottawa River, enable vessels to avoid Niagara Falls and the rapids of the St. Lawrence River.

Montreal, in the Province of Quebec, with a population of 216,650, is the largest city and metropolis of the Dominion. The Cathedral of Notre Dame, in this city, is the largest church building in America except the Mormon Tabernacle at Salt Lake City, Utah. Toronto, Halifax, and Quebec are the next cities in importance.

Sir Wilfred Laurier is the present Premier of the Dominion, and the Earl of Minto the Governor-General.

In 1900 British North America contained upwards of 17,000 miles of railroads, and the commerce of the Dominion is rapidly expanding.

Religion.—No State Church. By the latest available statistics, there were 1,791,982 Roman Catholics, 2,422,285 Protestants (Presbyterians, 676,165; Church of England, 574,818; Methodists, 1,042,980); Jews, 2,373.

Education is liberally encouraged. There are many excellent colleges throughout the

Dominion, and the public schools of Canada vie with those of the United States in point of excellence.

The United States

Among the nations of the earth, none has shown such marvelous achievements within so short a time as the United States of America. One and a quarter centuries ago 3,000,000 people were struggling for their independence. At the beginning of the nineteenth century they were among the weakest of nations. At the beginning of the twentieth they were one of the strongest in war, the greatest in industrial enterprise, and by far the most progressive people of the earth.

The United States is bounded on the north by the Dominion of Canada, on the east by the Atlantic Ocean, on the west by the Pacific Ocean, and on the south by the Republic of Mexico and the Gulf of Mexico. Its area is 3,602,990 square miles, and its population 76,295,220. If we add its colonial possessions of the Hawaiian Islands and those in the East and West Indies, its area will be increased over 150,000 square miles and its population augmented by 10,000,000.

THE PUBLIC DOMAIN.—In 1800 the public domain consisted of 404,955 square miles. Subsequent acquisitions were the following: The first was the purchase of Louisiana from France, which took place in 1802. This purchase included portions of the States of Alabama and Mississippi south of the thirty-first parallel—the entire surface of Louisiana, Arkansas, Missouri, Iowa, Nebraska and other states and territories to the Rocky Mountains, north of he boundary of Mexico.

The cost, according to the original treaty stipulations, was $15,000,000 in money and stocks. The interest on the stocks to the time of redemption was $8,529,353. The United States assumed the payment of certain claims of citizens of the United States against France, $3,738,208, making a total expenditure of $27,267,621. For this sum the Government obtained a title to 920,000 square miles of territory or 588,961,280 acres of land.

The next acquisition to the public domain (1819) was the purchase of Florida from Spain for the sum of $5,000,000. For this amount stocks were issued, and principal and interest amounted to $4,489,768. This purchase added to the public domain 59,267 square miles, which cost seventeen and one-sixteenth cents per acre.

In 1846 the Oregon country was acquired by treaty with England, adding to our territory 255,000 square miles. From it were formed the States of Washington, Oregon and Idaho.

The next acquisition to the public domain was from Mexico in 1848. By this cession the United States obtained the States of California, Nevada, and part of Colorado, also the lands in the Territories of Utah, Arizona, and New Mexico, which added 522,568 square miles to the public domain, at a cost of $15,000,000, or four and one-half cents per acre.

In 1850 the United States purchased of the State of Texas 96,707 square miles, or 61,892,480 acres, for the sum of $16,000,000, or 25 17-20 cents per acre. This territory is now included in Kansas, Colorado, and New Mexico, and embraces the "public land strip," or "No-Man's Land."

The next acquisition was in 1867, when Alaska was bought from Russia for the sum of $7,500,000.

In 1898 the Hawaiian Islands were annexed at their own request.

The same year Porto Rico was taken by conquest from Spain; and, by the Treaty of Peace at Paris which followed, the Philippine Islands were also acquired for the sum of $20,000,000.

The United States is composed of forty-five States, six Territories, the District of Columbia and the colonial possessions of Porto Rico, with 3,600 square miles and a population of 953,243, *Guam*, with 8,661 inhabitants, the *Philippine Islands*, with 140,000 square miles and 8,000,000 inhabitants, and *Tutuila*, the Samoan island, with fifty-four square miles and 4,000 inhabitants, which was acquired by virtue of the tripartite treaty with Great Britain and Germany in 1899.

The following table shows the dates of admission:

Population and Growth of the Various States During the Decade Shown by the Last Census.

Name of State	Admitted to the Union.	Population 1900	Population 1890	Increase.	Percentage of Increase.
Alabama	December 14, 1819.	1,828,697	1,513,017	315,680	20.8
Arkansas	June 15, 1836.	1,311,064	1,128,179	325,654	40.58
California	September 9, 1850.	1,485,153	1,208,130	276,923	22.9
Colorado	August 1, 1876.	539,700	412,198	127,502	30.9
Connecticut	Original State.	908,355	746,258	162,097	21.7
Delaware	Original State.	184 735	168,493	16,242	9.6
Florida	March 3, 1845.	528,542	391,422	137,120	35.
Georgia	Original State.	2,216,331	1,837,353	378,978	20.6
Idaho	July 3, 1890.	161,772	84,385	77,397	91.7
Illinois	December 3, 1818.	4,821,550	3,826,351	995,199	23.4
Indiana	December 11, 1816.	2,516,462	2,192,404	324,058	14.8
Iowa	December 28, 1846.	2,231 853	1,911,896	319 957	16.2
Kansas	January 29, 1861.	1,470,495	1,427,096	43,399	3.†
Kentucky	June 1, 1792.	2,147,174	1,858,635	288,539	15.6
Louisiana	April 30, 1812.	1,381,625	1,118,587	263,038	23.5
Maine	March 15, 1820.	694,466	661,086	33,380	5.4
Maryland	Original State.	1,190,050	1,042,390	148,660	14.2
Massachusetts	Original State.	2,805,346	2,238,943	566,403	25.2
Michigan	January 26, 1837.	2,420,982	2,093,889	327,093	15.9
Minnesota	May 11, 1858.	1,751,394	1,301,826	449,568	34.5
Mississippi	December 10, 1817.	1,551,270	1,289,600	261,670	20.3
Missouri	August 10, 1821.	3,106 665	2,679 184	427,481	16.
Montana	November 8, 1889.	243,329	132,159	111,170	84.1
Nebraska	March 1, 1867.	1,068,539	1,058,910	9,629	0.9
Nevada	October 31, 1864.	42,335	45,761	loss 3,426	loss 7.5
New Hampshire	Original State.	411,588	376,530	35,058	9.3
New Jersey	Original State.	1,883,669	1,444,933	438,736	30.3
New York	Original State.	7,268,012	5,997,853	1,270,159	21.2
North Carolina	Original State.	1,893,810	1,617,947	275,863	17.1
North Dakota	November 2, 1889.	319,146	182 719	136,427	74.7
Ohio	November 29, 1802.	4,157,545	3,672,316	485,229	13.2
Oregon	February 14, 1859.	413,536	313,767	99,769	31.8
Pennsylvania	Original State.	6,302,115	5,258 014	1,044,101	19.9
Rhode Island	Original State.	428,556	345 506	83,050	24.
South Carolina	Original State.	1,340 316	1,151,149	189,167	16.4
South Dakota	November 2, 1889.	401,570	328 808	72,762	22.1
Tennessee	June 1, 1796.	2,020,616	1,767 518	253,098	14.3
Texas	December 29, 1845.	3,048,710	2,235,523	813,187	36.4
Utah	January 4, 1896.	276,749	207,905	68,844	33.1
Vermont	March 4, 1791.	343,641	332,422	11,219	3.3
Virginia	Original State.	1,854,184	1,655,980	198,204	12.
Washington	November 11, 1889.	518,103	349,390	168,713	48.3
West Virginia	June 19, 1863.	958,800	762,794	196,006	25.9
Wisconsin	May 29, 1848.	2,069 042	1,686,880	382,162	22.7
Wyoming	July 10, 1890.	92 531	60,705	31,826	52.4
Alaska	Territory.	63,441	32,052	31,389	97.9
Arizona	Territory.	122 212	59,620	62,592	104.9
District of Columbia	National Capital.	278,718	230,392	48,326	20.9
Hawaii	Territory.	154,001	89,990	64.011	71.1
Indian Territory	Territory.	391,960	180,182	211,778	117.5
New Mexico	Territory.	195 310	153,593	41,717	27 2
Oklahoma	Territory.	398,331	61,834	336,497	544.2

Inhabitants.

The inhabitants of the United States are made up chiefly of English, Scotch and Irish stock, descended from the settlers from these sources during the past three hundred years. There has been, however, within the past fifty years a strong tide of emigration from Germany, Scandinavia and Italy. These different nationalities (with the exception of Italians) intermarry freely, and the American is therefore a combination of the best elements of the best blood of the earth. This fact, no doubt, had much to do with producing that progressive and ingenious character which has placed the American at the front in commerce and inventions.

The 8,000,000 people of African blood are descendants of the slaves of forty years ago, and since their emancipation have shown marked advance in every line of development. The public schools of America are the best in the world and every child has the chance of a liberal education with tuition free. Colleges and universities are numerous—every State has its State university; the religious denominations support hundreds of colleges, and the public schools of the large cities provide free curriculums

COMPARATIVE POPULATION OF ALL AMERICAN CITIES OF OVER 100,000 INHABITANTS

CENSUS OF 1900

Also statement of the area in acres covered by each, and average density of population.

	Comparative Chart According to Population		Area in Acres	Inhabitants per Acre
38	Scranton, Pa.	102,026	12,198	8 +
37	Memphis, Tenn.	102,320	10,240	10 —
36	Los Angeles, Cal.	102,475	17,774	6 —
35	Omaha, Neb.	102,555	15,680	7 —
34	St. Joseph, Mo.	102,979	6,400	16 +
33	Fall River, Mass.	104,863	26,240	4 —
32	Paterson, N. J.	105,171	5,357	19 +
31	New Haven, Conn.	108,027	14,340	8 —
30	Syracuse, N. Y.	108,374	10,041	9 +
29	Worcester, Mass.	118,421	21,772	5 +
28	Columbus, O.	125,560	10,400	12 +
27	Allegheny, Pa.	129,896	5,040	26 —
26	Toledo, O.	131,822	18,284	7 +
25	Denver, Col.	133,859	31,485	4 +
24	Rochester, N. Y.	162,435	11,635	14 —
23	St. Paul, Minn.	162,632	35,483	5 —
22	Kansas City, Mo.	163,752	16,640	10 —
21	Indianapolis, Ind.	164,164	17,792	9 +
20	Providence, R. I.	175,597	11,705	15 +
19	Minneapolis, Minn.	202,718	34,105	6 —
18	Louisville, Ky.	204,731	12,800	16 —
17	Jersey City, N. J.	206,433	8,320	25 —
16	Newark, N. J.	246,070	11,840	20 +
15	Washington, D. C.	278,718	44,320	6 +
14	Milwaukee, Wis.	285,315	13,624	21 —
13	Detroit, Mich.	285,704	18,560	16 —
12	New Orleans, La.	287,104	25,600	11 +
11	Pittsburg, Pa.	321,616	19,418	16 +
10	Cincinnati, O.	325,902	20,860	16 +
9	San Francisco, Cal.	342,782	27,000	13 —
8	Buffalo, N. Y.	352,219	25,344	14 —
7	Cleveland, O.	381,768	21,190	18 +
6	Baltimore, Md.	508,957	24,172	21 +
5	Boston, Mass.	560,892	60,661	9 +
4	St. Louis, Mo.	575,238	39,277	15 —
3	Philadelphia, Pa.	1,293,697	84,933	15+
2	Chicago, Ill.	1,698,275	122,240	12-
1	Greater New York, N. Y.	3,437,202	197,192	17+

From the chart and statistics it will be seen that New York has more than twice the population of Chicago and nearly three times that of Philadelphia. More people live in Greater New York City than inhabited the whole territory of the United States at the beginning of the Revolutionary War.

We have 38 cities of over 100,000 inhabitants each, and the six largest cities have a combined population of over 8,000,000, more than 10 per cent. of the entire population of the United States. It will also be noticed that the average density of population in New York is not so great as in many of the smaller cities, it having an average of only 17 + people to the square acre, while Allegheny, Pa., has nearly **26.**

COMPARATIVE RAILROAD MILEAGE OF THE WORLD

RAILROAD SPEED

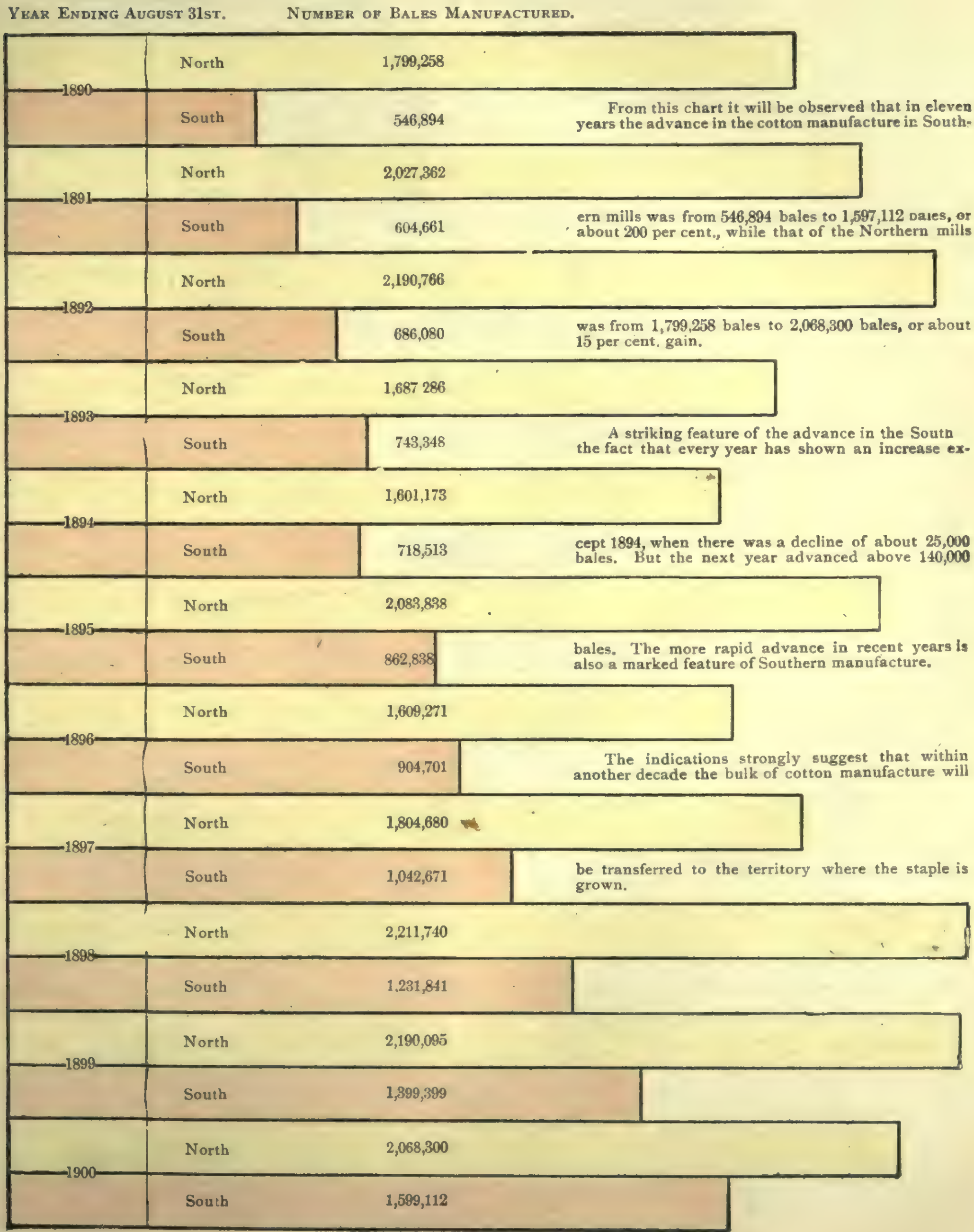
Notable Fast Runs of Passenger Trains for Long Distances, Including Stops.

May, 1848, Great Western (England), London-Didcot, distance, 53.25 miles; average miles per hour, 68.
Mar., 1892, New York Central & H. R., Onedia-De Witt, distance, 21.37 miles; average miles per hour, 72.69.
Nov., 1892, New York Central & H. R., Syracuse-Utica, distance, 51 67 miles; average miles per hour, 67.38.
May, 1893, New York Central & H. R., Syracuse Rochester, distance 80.38 miles; average miles per hour, 68.45.
April, 1895, Pennsylvania, Camden-Atlantic City, distance, 58.3 miles; average miles per hour, 76.50.
Sept., 1895, New York Central "World Flyer," Albany-Syracuse, distance, 148 miles; average miles per hour, 68.3.
Oct., 1895, Lake Shore & Michigan Southern, Chicago-Buffalo, distance, 510 miles; average miles per hour, 65.7.
April, 1897, Lehigh Valley, Black Diamond Exp., Alpine, N Y.-Geneva Junction, N. Y., distance, 43.96 miles; average miles per hour, 80.
Oct., 1899, Burlington Route, Mendota-Clyde, distance 74.3 miles; average miles per hour, 68.58.
May, 1900, Burlington Route, Burlington-Chicago, distance, 205.8 miles; average miles per hour; 65.5.

Fastest Recorded Runs for Short Distances, Without Stops.

July, 1890, Phila. & Reading, Skillmans-Belle Meade, distance, 4.1 miles; average miles per hour, 98.4.
May, 1893, N. Y. Central & H. R., Grimesville, distance, 1 mile; average miles per hour, 102.8.
May, 1893, N. Y. Central & H. R., Crittenden-"Empire State Express," distance, 1 mile; average miles per hour, 112.5.
May, 1893, N. Y. Central & H. R., Looneyville-Grimesville, distance, 5 miles; average miles per hour, 100.
Aug., 1895, Pennsylvania, Landover-Anacosta, distance, 5.1 miles; average miles per hour, 102.
Jan., 1899, Burlington Route, Siding-Arion. distance, 2.4 miles; average miles per hour, 130.

COMPARATIVE PROGRESS OF COTTON MANUFACTURING, NORTH AND SOUTH, 1890—1900

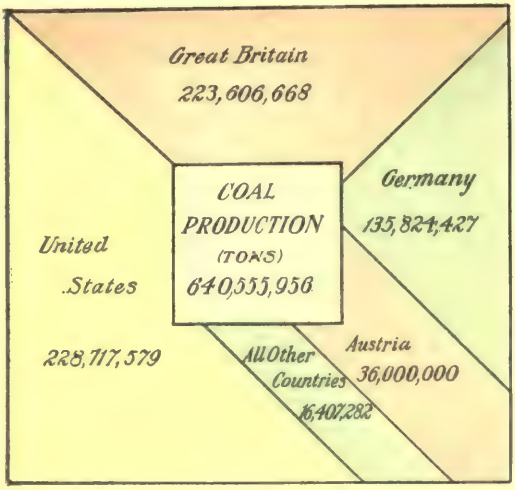


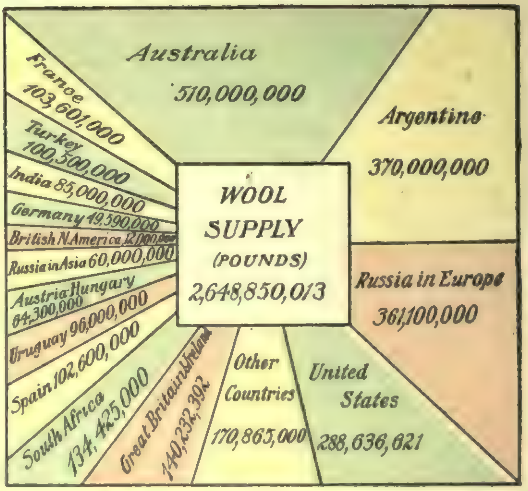
From this chart it will be observed that in eleven years the advance in the cotton manufacture in Southern mills was from 546,894 bales to 1,597,112 bales, or about 200 per cent., while that of the Northern mills was from 1,799,258 bales to 2,068,300 bales, or about 15 per cent. gain.

A striking feature of the advance in the Soutn the fact that every year has shown an increase except 1894, when there was a decline of about 25,000 bales. But the next year advanced above 140,000 bales. The more rapid advance in recent years is also a marked feature of Southern manufacture.

The indications strongly suggest that within another decade the bulk of cotton manufacture will be transferred to the territory where the staple is grown.

World's Annual Production of Four Great Staples





COAL

Area of the World's Coal Fields in Square Miles: China and Japan, 200,000; United States, 194,000; India, 35,000; Russia, 27,000; Great Britain, 9,000; Germany, 3,600; France, 1,800; all other European countries, 1,400; total, 471,800. It is estimated that the supply is sufficient at the rate of present demand to last the world 1000 years.

WOOL

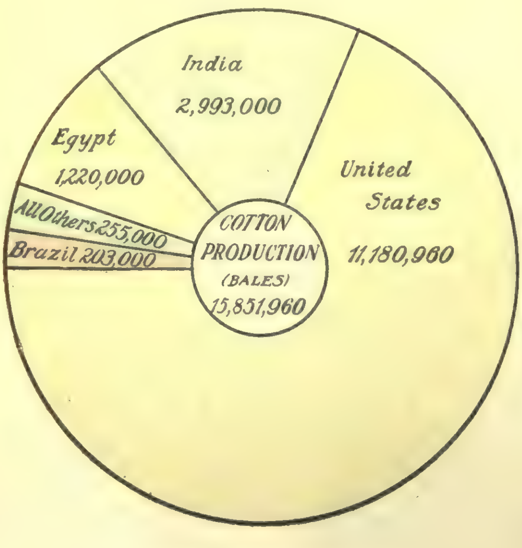
In 1860 the world's supply of wool was 955,000,000 pounds.
In 1900 the world's supply of wool was 2,685,105,013 pounds, nearly three hundred per cent. increase.

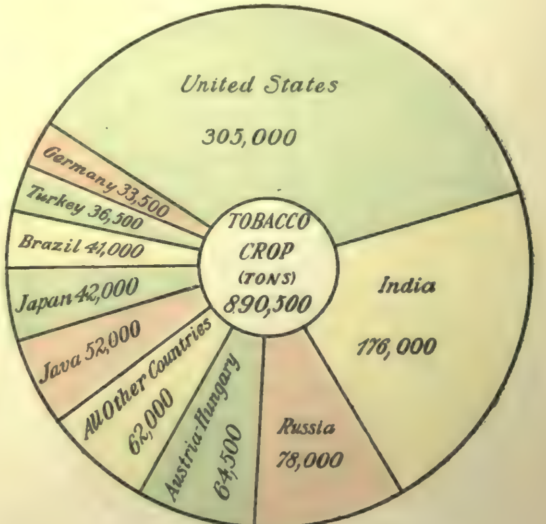
COTTON

The United States produces nearly three-fourths of all cotton grown in the world.

TOBACCO

More than one-third of the tobacco crop of the world is grown by the United States.

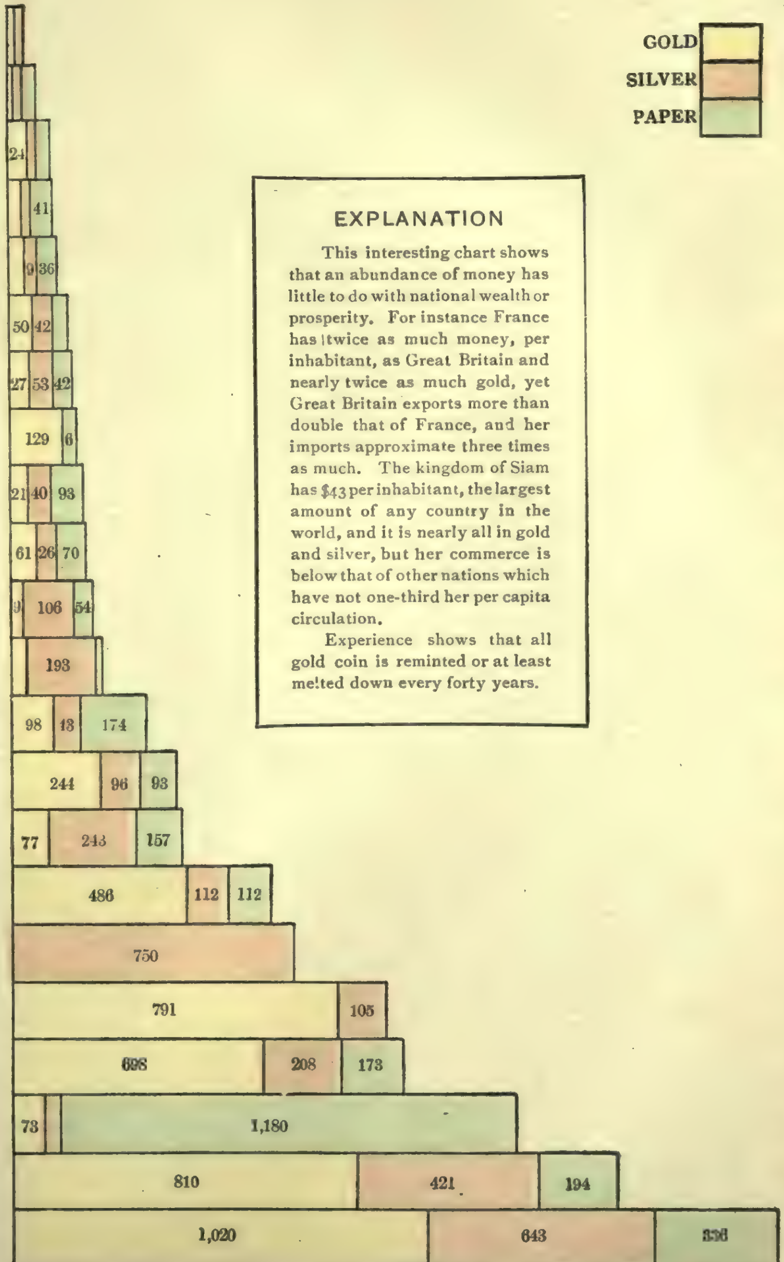




THE MONEY OF THE WORLD

Showing the Gold, Silver and Paper Currency of the Nations of the World, also the Amount per Capita. In Million Dollars.

Country	Gold	Silver	Paper	Total	Total Per Capita
Cuba	2	2		4	2.20
All Central American Republics	1	12	7	20	5.91
Switzerland	24	10	20	54	17.80
Canada	20	5	41	66	12.00
Norway and Sweden	22	9	36	67	8.50
Turkey and Greece	50	42	20	112	4.58
The Netherlands	27	53	42	122	24.00
Australasia	129	6		135	29.93
Belgium	21	40	93	154	22.98
Japan	61	26	70	157	9.93
Mexico	9	106	54	169	13.41
Siam	20	193	2	215	43.00
Italy	98	43	174	315	5.01
Austria-Hungary	244	96	93	433	9.36
Spain and Portugal	77	243	157	477	27.02
Great Britain	486	112	112	710	7.46
China		750		750	1.96
Russia	791	105		896	6.89
Germany	698	208	173	1,079	20.65
All South American Republics	73	24	1,180	1,277	33.00
France	810	421	194	1,425	32.03
United States	1,020	643	336	1,999	26.21

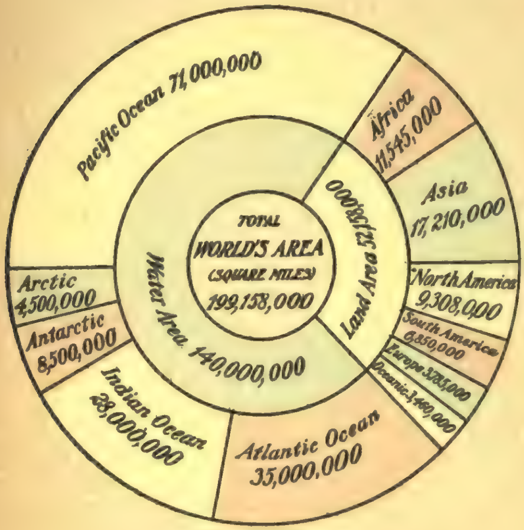


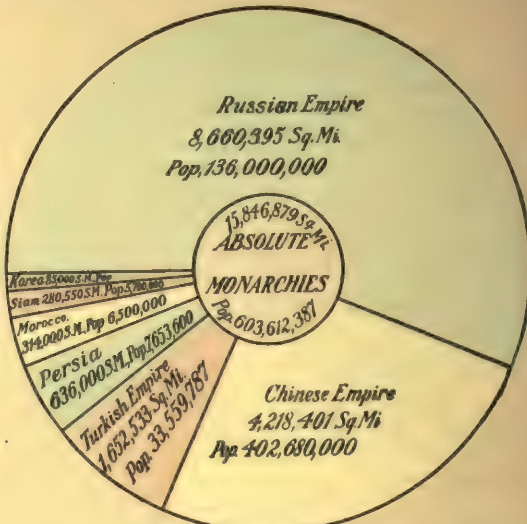
EXPLANATION

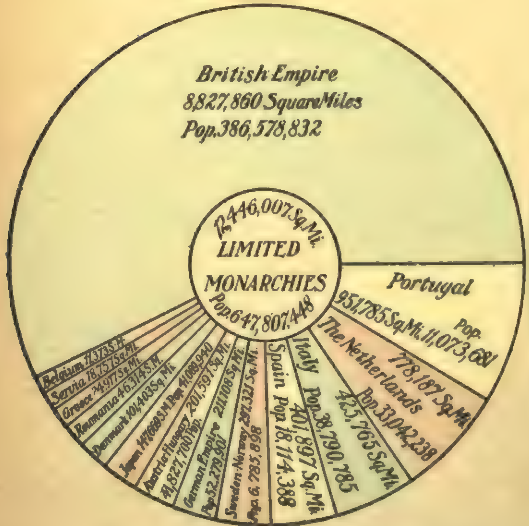
This interesting chart shows that an abundance of money has little to do with national wealth or prosperity. For instance France has twice as much money, per inhabitant, as Great Britain and nearly twice as much gold, yet Great Britain exports more than double that of France, and her imports approximate three times as much. The kingdom of Siam has $43 per inhabitant, the largest amount of any country in the world, and it is nearly all in gold and silver, but her commerce is below that of other nations which have not one-third her per capita circulation.

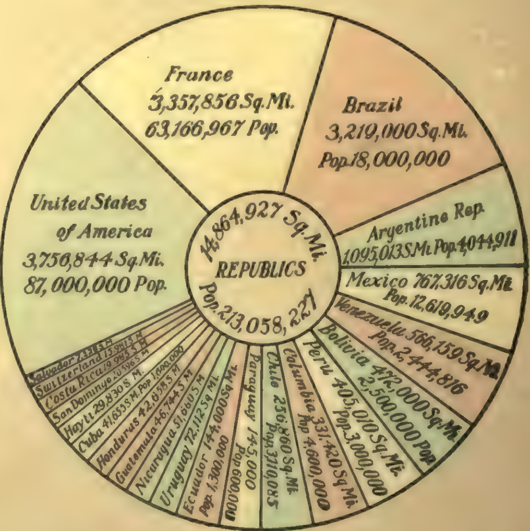
Experience shows that all gold coin is reminted or at least melted down every forty years.

Comparative Areas of Land and Water on the Globe and also comparative Areas and Population of the Nations of the World divided into Monarchies and Republics.









STATISTICS OF THE SMALLER COUNTRIES OF THE WORLD

		Population	Square Miles
Monarchies	Belgium	6,030,043	11,373
	Servia	2,096,043	18,757
	Greece	2,433,806	24,977
	Roumania	5,376,000	46,314
	Denmark	2,288,193	101,403
	Korea	10,519,000	85,000
	Siam	5,700,000	280,550
Republics	San Salvador	800,500	7,228
	Switzerland	2,933,334	15,981
	Costa Rica	[illegible]	19,985
	San Domingo	600,000	20,596
	Hayti	1,211,625	[illegible]
	Cuba	1,600,000	41,655
	Honduras	420,000	42,658
	Guatemala	1,535,632	46,774
	Nicaragua	420,000	51,660
	Uruguay	840,725	72,112

equal to the ordinary college of a few years ago.

In manufacturing and commerce the United States in the year 1900 took the lead among the nations of the earth. She has nearly, 90,000 miles of railroad within her borders, or about one-third of all the railroads of the earth.

THE GOVERNMENT is a model Republic administered by the President, as executive, and two branches of Congress—the Senate, composed of two members from each State in the Union, and the House of Representatives, composed of representatives apportioned among the different States in proportion to population. The President is elected by a College of Electors, the members of which are chosen in the different States by a majority vote. The Senators are elected by the State Legislatures. Representatives are elected by a direct vote of the people.

The State Governments are independent in administering their local affairs, but cannot make laws out of harmony with the United States laws. Each State has its Governor and two legislative branches, the Senate and House of Representatives, which meet at the State capital. The Governor and State legislative representatives are elected by direct vote of the people.

Theodore Roosevelt, the present President, succeeded the martyred McKinley, and was re-elected for a second term in 1904. Inaugurated March 4, 1905.

The New Possessions of the United States.

Porto Rico.—The island of Porto Rico, which came under the United States flag on October 18, 1898, is the most eastern of the Greater Antilles in the West Indies, and is separated on the east from the Danish island of St. Thomas by a distance of about fifty miles, and from Hayti on the west by the Mona Passage seventy miles wide. San Juan, the capital, is distant from New York 1,420 miles; Key West, Fla., 1,050 miles.

The island is a parallelogram in general outline, 108 miles from the east to the west, and from thirty-seven to forty-three miles across, the area being about 3,600 square miles, or somewhat less than half that of the State of New Jersey (Delaware has 2,050 square miles and Connecticut 4,990 square miles). The population, according to an enumeration made in 1887, was 798,565, of whom 474,933 were whites, 246,647 mulattoes, and 76,905 negroes. An enumeration taken by the United States Government in 1900 showed a population of 953,243.

Porto Rico is unusually fertile, and its dominant industries are agriculture and lumbering. The principal crops are sugar, coffee, tobacco, cotton, and maize, but bananas, rice, pineapples, and many other fruits are important products. The largest article of export from Porto Rico, is coffee, which is over 63 per cent. of the whole. The next largest is sugar, 28 per cent. The other exports in order of amount are tobacco, honey, molasses, cattle, timber, and hides.

There are 137 miles of railway, with 170 miles under construction, and 470 miles of telegraph lines. These connect the capital with the principal ports south and west. Submarine cables run from San Juan to St. Thomas and Jamaica. The principal cities are Ponce, 27,952 inhabitants; Arecibo, 30,000, and San Juan, the capital, 32,048.

An act providing for a civil government for Porto Rico was passed by Congress and received the assent of the President April 12, 1900.

Under this act a civil government was established, which went into effect May 1, 1900. The following is a list of the government officials:

Governor, salary \$8,000; Secretary, \$4,000; Attorney-General, \$4,000; Treasurer, \$5,000; Auditor, \$4,000; Commissioner of Interior, \$4,000; Commissioner of Education, \$3,000.

The above, with the exception of the Governor, together with five appointed by the Govenor, constitute the Executive Council, or "Upper House".

The House of Delegates, or Lower House, consists of thirty-five members, who were elected by the people at the election in 1900.

The Judiciary for the island is as follows: Supreme Court of Porto Rico—Chief Justice, salary \$5,000; and four Associate Justices, at salaries of \$4,500 each; and a Marshal, at a salary of \$3,000.

Hawaii was annexed to the United States by joint resolution of Congress July 6, 1898.

A bill to create Hawaii a Territory of the United States was passed by Congress and approved April 30, 1900.

The area of the several islands of the Hawaiian group is as follows; Hawaii, 4,210 square miles; Maui, 760; Oahu, 600; Kauai, 590; Molokai, 270; Lanai, 150; Niihau, 97; Kahoolawe, 63. Total, 6,740 square miles.

At the time of the discovery of the islands by Captain Cook in 1778, the native population was about 200,000. This has steadily decreased, so that at the last census the the natives numbered but 31,019, which was less than that of the Japanese and Chinese immigrants settled on the islands.

The first United States census of the islands was taken in 1900 with the following result: Hawaii Island, 46,843; Kauai Island, 20,562; Niihau Island, 172; Maui Island, 25,416; Molokai Island and Lanai Island, 2,504; Oahu Island, 58,504. Total of the territory, 154,001. The population of the city of Honolulu is 39,306.

There are seventy-one miles of railroad and about 250 miles of telegraph in the islands. Honolulu, the capital, population, 28,061, is lighted by electricity, and has most of the local features of an enterprising American city. The bulk of the business is done by Americans and Europeans.

Of sugar, of which it is said the Hawaiian Islands are much more productive in a given area than those of the West Indies, the exportation was 520,158,232 pounds in 1897. Of coffee, the exportation was 337,158 pounds in 1897; of rice, the exportation was 5,499,-499 pounds in 1897. In imports, nearly all of the necessities of life, aside from sugar, fruits, and vegetables, are imported, the products of the United States being given the preference in nearly all cases.

The new Territorial Government was inaugurated at Honolulu, June 14, 1900.

Guam.—The island of Guam, the largest of the Marianne or Ladrone Archipelago, was ceded by Spain to the United States by Article II. of the Treaty of Peace, concluded at Paris December 10, 1898. It lies in a direct line from San Francisco to the southern part of the Philippines, and is 5,200 miles from San Francisco, and 900 miles from Manila. It is about thirty-two miles long and 100 miles in circumference, and has a population of about 8,661, of whom 5,249 are in Agana, the capital. The inhabitants are mostly immigrants or descendants of immigrants from the Philippines, the original race of the Ladrone Islands being extinct. The prevailing language is Spanish. Nine-tenths of the islanders can read and write. The island is thickly wooded, well watered and fertile, having an excellent harbor.

Tutuila the Samoan island which, with its attendant islets, became a possession of the United States by virtue of the three party treaty with Great Britain and Germany in 1899, covers, according to the Bureau of Statistics of the Treasury Department, fifty-four square miles, and has 4,000 inhabitants. It possesses the most valuable island harbor, Pago-Pago, in the South Pacific, and perhaps in the entire Pacific Ocean. Commercially the island is unimportant at present, but is extremely valuable in its relations to the commerce of any nation desiring to cultivate transpacific commerce.

The Samoan Islands in the South Pacific are fourteen in number, and lie in a direct line drawn from San Francisco to Aukland, New Zealand. They are 4,000 miles from San Francisco, 2,200 miles from Hawaii, 1,900 miles from Aukland, 2,000 miles from Sydney, and 4,200 miles from Manila. The inhabitants are native Polynesians and Christians of different denominations.

The Philippine Islands.—As a result of the war between the United States and Spain, in 1898, the Philippine Islands came into possession of the former country.

The Philippine group, lying off the southern coast of Asia, between longitude 120 and 130 and latitude 5 and 20 approximately, number perhaps 1,200 islands, great and small, in a land and sea area of 1,200 miles of latitude and 2,400 miles of longitude. The actual land area is about 140,000 miles. The six New England States, New York, and New Jersey have about an equivalent area. The island of Luzon, on which the capital city (Manila) is situated, is the largest member of the group, being about the size of the State of New York. Mindanao is nearly as large, but its population is very much smaller. The latest estimates of areas of the largest islands are as follows: Luzon, 44,400; Mindanao, 34,000; Samar,

4,000; Panay, 4,700; Mindoro, 4,000; Leyte, 3,800; Negros, 3,300; Cebu, 2,400.

The estimates of population vary from 7,500,000 to 10,000,000. A conservative estimate is 8,000,000. There are thirty different races, all speaking a different dialect. The religion is largely Roman Catholic. In some of the smaller islands Mohammedanism prevails.

The climate is one of the best known in the tropics. The islands extend from 5° to 21° north latitude, and Manila is in 14° 35′.

Mineral Wealth.—Very little is known concerning the mineral wealth of the islands. It is stated that there are deposits of coal, petroleum, iron, lead, sulphur, copper, and gold in the various islands, but little or nothing has been done to develop them. A few concessions have been granted for working mines, but the output is not large. The gold is reported on Luzon, coal and petroleum on Cebu and Iloilo, and sulphur on Leyte.

Agriculture.—Although agriculture is the chief occupation of the Filipinos, yet only one-ninth of the surface is under cultivation. The soil is very fertile.

The chief products are rice, corn, hemp, sugar, tobacco, cocoanuts, and cacao. Coffee and cotton were formerly produced in large quantities—the former for export and the latter for home consumption; but the coffee plant has been almost exterminated by insects, and the home-made cotton cloths have been driven out by the competition of those imported from England.

In the fiscal year ending June 30, 1900, the exports from the United States to the Philippines had increased to $2,640,499, and the imports from the Philippines to $5,971,208. The total imports in the island in the fiscal year were $12,670,436, and exports $8,305,530.

The islands are at present governed by a military commission appointed by the President. Local self-government will, no doubt, be given the islands as soon as the people are prepared for it. Aguinaldo, the leader of the Philippinos, after several months of active opposition, was captured in 1901, and afterward issued a proclamation advising submission.

Mexico.

When the Spaniards discovered Mexico it was the home of the highest civilization in the New World. The Aztecs lived there and built large cities, mined copper and stone and other materials. Their King, Montezuma, was captured by Cortez, and the Aztecs, as a people, have disappeared.

The present Republic of Mexico comprises twenty-seven States, a federal district and the Territory of Lower California, embracing altogether 767,316 square miles and a population of 12,619,949. It is bounded on the north by the United States of America, south by Central America, west by the Pacific Ocean and Gulf of California, east by the Gulf of Mexico. The principal industries are agriculture, mining and stock-raising. Climate, mild and heathful in the elevated interior, but hot and pestilential along the coast. The Mexicans are a very mixed race, 20 per cent. being of the Caucasian race, 43 per cent. natives of mixed race, and 37 per cent. Indians. RELIGION—Prevailing religion, Roman Catholic, though by law there is toleration of all other religions. Protestant churches have about 26,000 adherents. GOVERNMENT—A confederate republic. Executive, the President. Legislative, the Congress, consisting of the House of Representatives with 227 members, and the Senate with fifty members. EDUCATION—9,000 elementary schools with over 500,000 pupils, and 140 higher schools with 17,000 scholars. Government grant, $3,400,000. FINANCE—Revenue (estimated), $35,000,000; expenditures (estimated), $28,100,000. Chief articles exported, precious metals, textile fibres. INDUSTRIES—Chiefly mining and cattle-raising. Between 1821 and 1880 silver to the value of $900,000,000, and gold to the value of $4,841,000 were produced. Ninety-six cotton factories, with over 14,000 employees, were also in operation in 1898.

Mexico is a marvelously picturesque country. The surface is a high plateau crossed by several ranges of white-capped mountains. The rivers are shallow and rapid streams, none of them navigable above tide-water except the Rio Grande and Colorado. Owing to the difference of elevation,

Mexico has a variety of climate and productions. The coast regions are low, hot and pestilential. The elevated regions are cool and healthful. The city of Mexico, the capital, is a walled city, entered by gates. General Porfirio Diaz, the President of Mexico, was born in 1830 and became President of the Republic in 1884.

Central America.

Central America comprises all of the mainland lying south of Mexico to the South American Continent, divided among five independent republics and the British colony of Balize, area and populations of which were given in the general list of republics at the beginning of the article on the American Continent.

Guatamala, the most northern of the states, is about the size of Ohio. It has little trade, and is known as "Uncommercial Guatamala." Some interesting ruins of old cities are in this republic. *Honduras* has high mountains and dense forests of valuable woods.

Salvador is the smallest but most densely populated Central American country, and has eleven volcanoes within its limits, *Nicaragua* is the longest Central American state. The attention of the world has been attracted to it by the proposed ship canal across that country.

Costa Rica is the most southerly of these little republics. Valuable forests cover its surface and mother-of-pearl is found in abundance along its shores.

Balize, or British Honduras, is the only part of Central America that belongs to a foreign power.

The population of this whole Central American country is principally composed of the descendants of Spaniards and of Indians and negroes, and mixed breeds of these with white men who have gone there to cut valuable timber in which the land abounds, or to engage in mining. The people more closely resemble those of Mexico than any other, and the Spanish language prevails as does also the Roman Catholic religion.

The Governments are Republican, modeled after the United States, but revolutions are frequent and g vernment is unstable.

Th West Indies.

The West adies consist of about 1,000 islands exten ing in two chains southeast from the coa of North America. Some of them are li tle more than coral rocks. Others larg and very fertile. They are divided ph sically into the Bahamas, the Greater Antilles and the Lesser Antilles. They all lie between the latitudes of 10° to 27° north latitude, and consequently are all hot and tropical. Politically, until 1898, when the American war with Spain liberated Cuba and Porto Rico, they were all (except the island of Hayti) controlled by European powers.

Porto Rico is now a colony of the United States.

Cuba is an independent republic under the foster care or protection of the United States until its government can be established, which end the people of the island and the United States are both uniting their efforts to accomplish on a basis that will best serve the interest of Cuba and that of her great sister republic and protector.

Hayti comprises two independent republics, Hayti and Santo Domingo. The people and rulers are principally negroes.

Havana, the capital of Cuba, with a population of 200,000, is the principal city of the West Indies, and it ranks second among the cities of the New World in extent of foreign commerce.

SOUTH AMERICA

The southern continent of the Western Hemisphere is joined to North America by the Isthmus of Panama, which at its narrowest part is only thirty miles wide. South America lies almost wholly in the torrid zone, which doubtless accounts for the lack of progress and enterprise manifested throughout this great and powerful continent. Its area comprises roundly, 7,000,000 square miles, nearly twice that of Europe, and one-eighth the entire land-surface of the globe. Like North America, South America

is triangular in form. It is, however, more compact and possesses a smoother coast line, fewer harbors and fewer islands than its northern neighbor. Toward the south, however, a large number of almost useless islands occur. The Terra del Fuego (or fire islands) are a positive injury to the continent, since they imperil shipping, and are well-nigh worthless, with a degraded population. Morajo or Johannes Island, however, is more elevated and furnishes rich pasture-land, as do also the Falkland Islands, which have a good harbor, and belong to Great Britain. The other islands worthy of mention are the Gallapagos Islands (where the largest turtles in the world are found—weighing from 1,000 to 1,500 pounds) and the Easter Islands, the latter situated in the Pacific Ocean west of Chili.

The mountains of South America consist of a series of lofty ridges running parallel, uniting in mountain groups and inclosing long narrow plateaus. They are exceedingly wild and broken. Rushing torrents, deep gorges, jagged peaks, cliffs and impassable chasms abound. Sixty of the mountain peaks are active volcanoes, and the countries within the Andes are subject to frequent and destructive earthquakes. In the extreme South numerous glaciers come down to the water's edge, as they do along the Alaskan coasts of North America. For 3,000 miles along the Andes Mountains engineers say there is no gap or pass where a railroad could be built, and travelers must cross the mountains by winding paths, on foot or with donkeys, or llamas as beasts of burden. The railroad across these mountains in Peru is one of the greatest engineering feats in the world.

The plains and lowlands constitute four-fifths of the continent, and are divided into the *Llanos*, *Pampas*, and *Selvas*.

The *Llanos* are treeless and very flat. During the wet season as far as the eye can reach the land is covered with the finest of vegetation, and seems like a great sea of grass. Beautiful flowers of every hue lift up their heads. The air is filled with insects. Herds of wild cattle and horses feed over the plains, and in places men on horseback may be seen pursuing them with lassoes. When the sun moves away from overhead and the rain ceases to fall, the grass dries up and the vast plain turns brown. The earth becomes dry and hard, and moving hills of sand make clouds of dust. The entire expanse of the llanos is less than 200 feet above the sea. These plains cover an area of 160,000 square miles.

The *Pampas* are almost perfectly level, without stones and for the most part without trees. Instead of the fine rich grass of the llanos, they are covered with a very coarse grass and with clover and forests of thistle ten or twelve feet in height. The thistle-stalks are sometimes cut down for fuel. Millions of wild cattle and horses roam over these plains.

The *Selvas* have an area of more than two million square miles. Here are the densest and most extensive forests in the world. The foliage in places is so thick and dark that the sun never penetrates it. A perpetual mist hangs over the lower Amazon, and all the colors of vegetation and of animal life are brilliant in the extreme. These forests present an almost numberless variety of trees, but the stillness and gloom of their depths are almost painful.

The principal rivers of South America are the Amazon and its tributaries, the La Plata and the Orinoco. The Amazon exceeds in volume every other river on the globe, and discharges more water into the sea than the eight largest rivers of Asia. The name is derived from an Indian word meaning *boat*-destroyer, from the destructive tidal waves at its mouth. With its tributaries it affords 10,000 miles of interior navigation.

The lakes of South America are few in number. *Lake Titicaca* is 240 miles in circumference, and is famous as lying at the greatest elevation of any large navigable lake in the world.

The climate of South America is of every variety. In the lowlands near the equator it is always summer; on the high mountains always like winter; on the elevated plains more like the usual spring and early fall of the temperate zone.

The products vary with the climate, and resemble those of the West Indies and Central America, generally speaking. In the

torrid zone, where rainfall is great, everything is very luxuriant. The animal life of the continent, like the vegetable, varies with the climate. South America is richer in birds and insects than any other continent. Wild horses and cattle abound on the plains. Beasts of prey are less numerous than in North America, but the tapir, ant-eater, monkey, parrot, alligator, turtle, and condor live and flourish as nowhere else.

Inhabitants.—South America was inhabited by Indians when the white man discovered it, and they still number several millions and in the interior are still savage. Indians and mixed races yet form the greater part of the population, but the ruling people are the descendants of the Portuguese and Spaniards who settled the continent. These number about one-third of the population. In Brazil negroes—descendants from former slaves—also form a large element of the population. The Roman Catholic faith is the prevailing form of religion.

Industries.—Agriculture, including stock-raising, furnishes the principal employment of the people. Mining is carried on to some extent in the highlands, but the vast mineral wealth of the continent is barely touched. Manufacturing is of meagre importance.

The political divisions of South America consist of ten republics and the provinces of Guiana. The republics are fashioned, like those of Central America, after the United States in their form of government, but their affairs are poorly handled, and few of them are prosperous. Political commotions have interfered with the advance and success of the people. The countries are jealous and unfriendly in spirit toward one another. Some of the presidents are elected for six years and have practically the same power as monarchs. Revolutions are frequent.

The above are the South American countries, with the latest obtainable statistics concerning their areas and population:

COUNTRY.	CAPITAL.	Area Sq. Miles.	Population.
Brazil	Rio de Janeiro	3,219,000	18,000,000
Venezuela	Caracas	566,159	2,444,816
Colombia	Bogota	331,420	4,600,000
Ecuador	Quito	248,380	1,300,000
Peru	Lima	405,040	3,000,000
Bolivia	Chuquisaca	472,000	2,500,000
Chili	Santiago	256 850	3,110,085
Argentine	Buenos Ayres	1,095,013	4,844,911
Uruguay	Monte Video	72,111	559,668
Paraguay	Asuncion	92,000	840,725
Guiana, British	Georgetown	76,000	600,000
" French	Cayenne	46,880	36,000
" Dutch	Paramaribo	46,072	71,800
Falkland Islands	Stanley	6,500	1,800
South Georgia		1,570	
	Total	6,934,995	41,909,805

From the above table it will be seen that the population of all South America amounts to about one-half that of the United States. But the great natural resources of the continent, its navigable rivers and fertile soil, make it possible for this continent to become one of the most populous and productive of the earth.

Chronology of Great Historical Events.

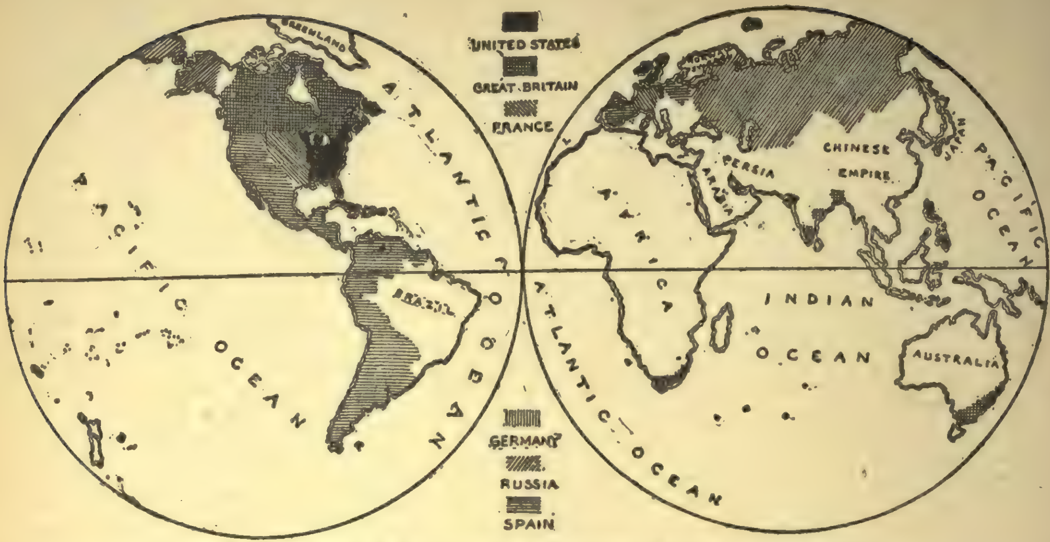
B. C.

878 Carthage founded.
776 Olympic Era began.
753 Foundation of Rome.
588 Jerusalem taken by Nebuchadnezzar.
536 Restoration of the Jews under Cyrus.
509 Expulsion of the Tarquins from Rome.
480 Heroism of the Spartans at Thermopylæ.
55 Cæsar conquered Britain.
4 Birth of Jesus Christ.

A. D.

29 The Crucifixion.
70 Jerusalem was destroyed by Titus.
313 Constantine converted to Christianity.
410 The Romans abandoned Britain.
827 Egbert, first king of all England.
1066 Battle of Hastings, Norman Conquest.
1096 The Crusades began.
1172 Ireland was conquered by Henry II.
1215 King John granted Magna Charta, June 15.
1265 First Representative Parliament in England.
1415 Battle of Agincourt, Oct. 25.
1431 Joan of Arc was burnt, May 30.
1453 Constantinople taken by the Turks.
1455 The Wars of the Roses began.
1462 The Bible was first printed at Mentz.
1471 Caxton set up his printing press.
1486 The feuds of York and Lancaster ended.
1492 Columbus discovered America, Oct. 12.
1517 The Reformation began in Germany.
1519 Cortez began the conquest of Mexico.
1535 The first English Bible printed.
1539 Monasteries were closed in England.
1558 Accession of Queen Elizabeth, Nov. 17.
1565 Revolt of the Netherlands began.
1572 The St. Bartholomew Massacre, Aug. 24.
1588 The Spanish Armada defeated.
1600 East India Company first chartered.
1603 Union of England and Scotland, March 24.
1605 The Gunpowder Plot in England.
1607 Jamestown, Va., was settled.

1609 Hudson River first explored.
1616 Shakespeare died, April 23.
1618 Thirty Years' War in Germany began.
1620 Pilgrims by the Mayflower landed.
1623 Manhattan Island settled.
1634 Maryland settled by Roman Catholics.
1636 Rhode Island settled by Roger Williams.
1640 Cromwell's Long Parliament assembled.
1649 Charles I. was beheaded, Jan. 30.
1653 Oliver Cromwell became Lord Protector.
1660 Restoration of the Stuarts.
1664 New York conquered from the Dutch.
1664 The great plague of London.
1666 The great fire of London began Sept. 2.
1679 Habeas Corpus Act passed in England.
1682 Pennsylvania settled by William Penn.
1685 Revocation of the Edict of Nantes, Oct. 22.
1688 James II. abdicated, Dec. 11.
1690 Battle of the Boyne, July 1.
1690 First newspaper in America; at Boston.
1704 Gibraltar was taken by the English.
1713 Peace of Utrecht, April 11.
1714 Accession of House of Hanover, Aug. 1.
1715 First Jacobite Rebellion in Great Britain.
1720 South Sea Bubble.
1745 Battle of Fontenoy, April 30.
1745 Second Jacobite Rebellion in Great Britain.
1756 Black Hole Suffocation in Calcutta.
1757 Clive won Battle of Plassey in India.
1759 Canada was taken from the French.
1765 Stamp Act enacted.
1773 Steam engine perfected by Watt.
1773 Tea destroyed in Boston Harbor, Dec. 16.
1775 Battle of Lexington, April 19.
1775 Battle of Bunker Hill, June 17.
1776 Declaration of Independence, July 4.
1777 Burgoyne's surrender, Oct. 17.
1779 Capt. Cook was killed, Feb. 14.
1781 Cornwallis' surrender at Yorktown, Oct. 19.
1788 First settlement in Australia, Jan. 26.
1789 The French Revolution began July 14.
1789 Washington first inaugurated President.
1793 Cotton-gin invented by Whitney.
1793 Louis XVI. of France executed, Jan. 21.
1796 Vaccination discovered by Jenner.
1798 The Irish Rebellion.
1799 Battle of Seringapatam; death of Tippoo.
1799 Bonaparte declared First Consul, Nov. 10.
1801 Union of Great Britain and Ireland, Jan. 1.
1803 Louisiana purchased from the French.
1804 Bonaparte became Emperor of France.
1805 Battle of Trafalgar; death of Nelson.
1807 Fulton's first steamboat voyage.
1812 Second war with Great Britain.
1812 The French expedition to Moscow.
1813 Perry's victory on Lake Erie, Sept. 10.
1814 The printing machine invented.
1814 Scott's "Waverley" published.
1815 Battle of New Orleans, Jan. 8.
1815 Battle of Waterloo, June 18.
1819 First steamship crossed the Atlantic.
1820 Missouri Compromise adopted.
1823 Monroe Doctrine declared, Dec. 2.
1828 First passenger railroad in the United States.
1830 Revolution in France, Orleanist succession.
1832 South Carolina Nullification Ordinance.
1835 Morse invented the telegraph.
1835 Seminole War in Florida began.
1837 Accession of Queen Victoria, June 20.
1845 Texas annexed.
1846 Sewing machine completed by Elias Howe.
1846 The Irish Potato Famine.
1846 British Corn laws repealed, June 26.
1846 War with Mexico began.
1848 French Revolution, Republic succeeded.
1848 Gold discovered in California.
1851 Gold discovered in Australia.
1851 First International Exhibition, London.
1852 Louis Napoleon became Emperor, Dec. 2.
1853 Crimean War began.
1857 The Great Mutiny in India.
1857 The Dred Scott decision.
1859 John Brown's raid into Virginia.
1860 South Carolina seceded, Dec. 20.
1861 Emancipation of the Russian serfs.
1863 Lincoln's Emancipation Proclamation, Jan. 1
1863 Battle of Gettysburg, July 1-3.
1865 Lee surrendered at Appomattox, April 9.
1865 President Lincoln assassinated, April 14.
1866 Battle of Sadowa. Prussia beat Austria.
1867 Emperor Maximilian of Mexico executed.
1867 The Dominion of Canada established.
1870 Franco-German War began, July 19.
1870 Capitulation of French at Sedan, Sept. 1.
1870 Rome became the capital of Italy.
1871 The German Empire re-established.
1871 The Irish Church was disestablished.
1871 The great fire in Chicago, Oct. 8-11.
1872 The great fire in Boston, Nov. 9.
1876 Centennial Exposition at Philadelphia.
1881 President Garfield shot.
1882 British occupation of Egypt.
1889 Brazil became a Republic.
1893 World's Columbian Exposition at Chicago.
1894 Chinese-Japanese War began.
1895 Cuban Revolution began, Feb. 20.
1895 McKinley inaugurated President of the United States.
1897 The Turkish-Greek War.
1898 The Spanish-American War.
1898 The Filipino War.
1899 Universal Peace Conference.
1899 The South African War.
1900 Invasion of China by allied European and American forces.
1901 Australia became a Federal Union, January 1.
1901 Death of Queen Victoria.
1901 Edward VII. becomes King of England.
1901 Marriage of Queen Wilhelmina.
1901 McKinley inaugurated President of the United States second time. Assassinated Sept. 14, 1901.
1904-5 Russo-Japanese War.



THE MAP OF THE WORLD AT BEGINNING OF 19TH CENTURY

Showing the possessions of the six great powers—Great Britain, Spain, France, Germany, Russia and the United States. Of the Chinese Empire, Africa and Australia, little was known at the beginning of the old century.

THE MAP OF THE WORLD AT THE BEGINNING OF 20TH CENTURY

Showing the political boundaries of the six great powers at the beginning of the new century. Africa, Australia and portions of China have been absorbed by one or more of the great powers. Spain has withdrawn from the Western Hemisphere, and South America is held by independent governments.

THE HISTORY OF THE WORLD BY CENTURIES

ANCIENT HISTORY TO THE CHRISTIAN ERA.

2229 TO 1000 B. C.

2229 Assyria founded by Ashur.

2200 The Hia dynasty in China founded.

2188 Misriam settled Egypt.

2100 Nimrod builds Babylon.

2000 Ninus builds Nineveh.

2000 Cuneiform writing used.

1950 Abraham flourished.

1896 to 1800 Isaac, Jacob and Joseph succeeded each other in Jewish History.

1582 Beginning of the Arundelian marble Chronology.

1500 Sesostris, King.

1500 Moses flourished.

1450 Joshua flourished.

1450 Israelites enter Canaan.

1352 Rule of the Judges begins in Israel

1273 Rise of the Assyrian Empire.

1184 Trojan War.

1125 Samuel flourished.

1100 Chow dynasty in China founded.

1090 Saul flourished.

1050 David flourished.

1050 Codrus King of Athens

1048 David takes Jerusalem.

1048 Hiram, King of Tyre.

1000 Solomon flourished.

1000 TO 600 B. C.

975 Rehoboam, King after Solomon.

971 Revolt of the Ten Tribes under Jeroboam.

971 Egyptians capture Jerusalem.

884 Lycurgus reforms Spartan Constitution.

878 Carthage founded by Dido.

776 The Olympiads. First authentic date in Greek History.

758 Syracuse founded.

753 Rome founded.

747 Babylon independent under Nebonassar.

743-723 First Messinian War.

730 Shalmenezer subdued Phœnicia.

722 Samaria taken by Sargon, King of Assyria. End of the Kingdom of Israel. Judah remains 130 years longer.

720 Sennacherib besieges Jerusalem—his army destroyed.

700 Numa Pompilius, King of Rome.

687 Second Messinian War.

624 Draco's Laws at Athens.

602 King Jehoiakim revolts from Babylon.

600 TO 500 B. C.

598 Capture of Jerusalem by Nebuchadnezzar.

594 Legislation of Solon at Athens.

588 Pythian games begin celebration every 5 years.

586 Jerusalem destroyed by Nebuchadnezzar. End of the Kingdom of Judah.

579 Nebuchadnezzar takes Tyre.

569 Same Monarch conquers Egypt.

559 Persian Empire founded by Cyrus.

554 Cyrus conquers Lydia and captures Croesus.

540-10 Era of Pythagoras.

539 Marseilles founded by the Phoenicians.

538 Cyrus captures Babylon.

536 Cyrus releases Jews from captivity.

535 Temple at Jerusalem rebuilt.

529 Death of Cyrus. Cambyses succeeds him.

525 Conquest of Egypt by Cambyses.

521 Darius I King of Persia.

518 Birth of Pindar.

515 2nd Temple dedicated.

510 Tarquins Expelled.

510 Rome and Athens become Republics

508 1st Treaty, Rome and Carthage.

507-06 Darius makes conquest of Thrace Pæonia and Macedonia.

FROM THE YEAR 900 TO 1500 A.D.

900 to 1000 A. D.

01 Alfred's death.
11 Rollo the Norseman obtains Neustria.
11 Conrad I., Emperor of Germany.
36 Otho the Great, Emperor of Germany.
40 Emir al Omra first appointed
62 Otho crowned Emperor of the West.
69-75 John Zimisces, Emperor of the East.
73 Otho's death.
87 Capetian dynasty begins in France (Hugh Capet King).

1000 to 1100 A. D.

17 Canute the Dane on the English Throne.
40 Normans conquer South Italy.
41 Edward the Confessor restores the Saxon line in England.
55 Bagdad taken by the Turks.
61 The Guelph and Ghibelline Feud begins.
65 Jerusalem taken by the Turks.
66 The Norman conquest of England.
81 Battle of Durazzo.
81 Gregory deposed.
96 The First Crusade.
99 Jerusalem taken by Crusaders.

1100 to 1200 A. D.

02 Guiscard of Normandy, King of Naples.
18 Knights Templars instituted.
37 Justinian's Pandects discovered at Amalfi.
47 The Second Crusade.
52 Frederick Barbarossa, Emperor of Germany.
54 Accession of Plantagenets in England.
70 Thomas a Becket died.
72 Invasion of Ireland under Henry II. of England.
76 Germans under Frederick defeated at Legnano.
87 Jerusalem taken by Saladin.
89 The Third Crusade.
89 Richard (the Lion-hearted) King of England.
95 The Fourth Crusade.
98 The Fifth Crusade.

1200 to 1300 A. D.

03 Conquest of Constantinople by the Crusaders.
08 War against Albigenses in Languedoc.
12 The Boy Crusade.
15 Magna Charta signed by John of England.
27 The Sixth Crusade.
27 Zenghis Khan overruns the Saracen empire.
33 Inquisition formally established by Gregory IX.
37 Russia made tributary to the Moguls.
48 The Seventh Crusade.
58 End of the Abbaside Caliphs.
61 The Greeks retake Constantinople.
70 The Eighth Crusade—death of St. Louis.
70 Egypt falls into the hands of the Mamelukes.
73 Rudolph of Hapsburg elected Emperor of Germany.
81 Conquest of Prussia by the Teutonic Order.
82 Conquest of Wales by Edward I. of England.
91 Acre taken by the Turks—end of the Crusades.

1300 to 1400 A. D.

02 Battle of Courtrai.
05 Seat of the Popedom removed to Avignon.
07 The Swiss Revolution begins.
14 Battle of Bannockburn.
15 Battle of Morgarten.
46 Battle of Cressy.
47 Rienzi tribune of Rome.
52 Union of the eight Swiss Cantons.
56 Charles IV. of Germany institutes the Golden Bull—the fundamental law of the Empire.
60 Calais and the S. W. of France ceded to England.
61-89 Ottomans under Murad I. conquer Asia Minor and pass into Europe.
64 Final embodiment of the Hanseatic League by Act signed at Cologne.
77 Return of the Popes to Rome.
86 Battle of Sempach.
92 The Cape of Good Hope discovered by the Portuguese.
97 The Treaty of Calmar, uniting Denmark, Sweden and Norway under Margaret.
98 Tamerlane takes Delhi.
99 Henry IV. (Lancaster) King of England.

1400 to 1500 A. D.

02 Tamerlane defeats the Turks at Angora.
15 Battle of Agincourt.
15 John Huss burned.
16 Jerome of Prague burned.
28 Cosmo de Medici flourished (Florence).
28 Joan of Arc victorious at Orleans.
31 Her death.
44 Guttenberg prints at Strasburg.
45 Accession of Constantine Palæologus, last of the Byzantine Emperors.
53 Constantinople taken by the Turks.
55 Wars of the Roses begin in England.
73 Copernicus flourished.
74 Michel Angelo flourished.
78 Lorenzo the Magnificent rules Florence.
79 Union of Castile and Aragon under Ferdinand and Isabella.
83 Raphael flourished.
85 Battle of Bosworth.
91 Fall of Granada.
92 Columbus discovers America.
94 Invasion of Italy by Charles VIII. of France.
97 Cape of Good Hope doubled by Vasco di Gama.
97 Cabot explores coast of North America.
98 Savonarola burned at Florence.
99 Switzerland independent.

The 16th and 17th Centuries from 1500 to 1700 A. D.

FIRST 50 YEARS 18TH CENTURY

1500 to 1550 A. D.

04 Battle of Cerizoles—the French lose Naples.

08 League of Cambray against Venice.

13 Battle of Flodden.

15 Francis I. becomes King of France.

16 Charles I. becomes King of Spain.

17 Luther publishes his ninety-five Theses.

19 Charles I. of Spain becomes Emperor Charles V.

19 The Disputation at Leipsic.

20 Luther burns the Papal Bull.

21 Cortez takes Mexico.

25 Battle of Pavia.

27 The sack of Rome by Bourbon Troops.

29 The Reformers first called Protestants at Spires.

30 The League of Smalcald.

33 Pizarro conquers Peru.

35 The Order of Jesuits founded by Loyola.

45 The Council of Trent begins to sit.

49 Charles V. grants the Interim.

1550 to 1600 A. D.

52 The Treaty of Passau.

56 The abdication of Charles V.

58 Elizabeth becomes Queen of England.

58 The Inquisition established in France.

62 Battle of Dreux.

70 The Peace of St. Germain en Laye.

71 Battle of Lepanto—Turks defeated by Don John of Austria.

72 The Massacre of St. Bartholomew.

74 Siege of Leyden.

79 The Union of Utrecht.

87 Mary Queen of Scots beheaded.

88 Defeat of the Spanish Armada.

89 Henry IV. (first royal Bourbon) becomes King of France.

90 Battle of Ivry.

98 The Edict of Nantes.

98 Peace of Vervins.

1600 to 1650 A. D.

03 Union of the English and Scottish Crowns.

10 Assassination of Henry IV.

18 Opening o. the Thirty Years' War.

20 Defeat of the Elector Frederick at Prague.

24 Richelieu gains a seat in the Council.

28 The Siege of Rochelle.

29 Peace of Lubeck.

30 Gustavus Adolphus lands in Pomerania.

30 Sack of Magdeburg.

31 Battle of Leipsic.

32 Battle of Lutzen—Death of Gustavus Adolphus.

48 The great Peace of Munster or Westphalia.

49 Charles I. of England beheaded.

1650 to 1700 A. D.

53 Cromwell, Protector of England.

60 The restoration of the Stuarts in England.

68 Peace of Aix-la-Chapelle.

74 Battle of Seneffe.

78 Treaty of Nimeguen.

79 Habeas Corpus Act passed in England.

83 John Sobieski of Poland defeats the Turks at Vienna.

85 The Edict of Nantes revoked by Louis XIV.

86 The League of Augsburg.

88 The second English Revolution

89 Peter the Great, sole ruler of Russia.

90 Battle of the Boyne.

92 Battle of La Hague.

97 Treaty of Ryswick.

97 Charles XII. becomes King of Sweden.

99 Settlement of Louisiana.

1700 Battle of Narva.

1700 to 1750 A. D.

01 The Grand Alliance.

02 French fleet destroyed at Vigo.

04 Battle of Blenheim.

06 Battle of Ramillies.

07 Union of England and Scotland.

08 Battle of Oudenarde.

09 Battle of Pultowa.

09 Battle of Malplaquet.

13 Treaty of Utrecht.

14 The Guelphs ascend the English throne.

15 Death of Louis XIV. of France.

18 Charles XII. of Sweden killed at Fredericshall.

25 Death of Peter the Great.

40 Frederic the Great becomes King of Prussia.

42 Treaty of Breslau.

43 Battle of Dettingen.

45 Battle of Fontenoy.

45 Peace of Dresden.

48 Second Peace of Aix-la-Chapelle.

From 1865 to the Opening Years of the 20th Century.

1865 to 1875 A. D.

66 War between Italy and Germany.

66 Prim insurrection in Spain.

66 War between Germany and Austria.

66 Battle of Sadowa.

66 Reciprocity Treaty between U. S. and Canada.

66 Austria withdraws from German confederation.

67 English War with Abyssinia.

67 Dominion of Canada formed.

67 Alaska purchased by the United States.

67 Maximilian executed.

69 Disestablishment of the Irish Church.

69 Cuban revolt.

69 U. S. Grant, President, U.S.

70 War between France and Germany.

70 Battle of Sedan.

70 Surrender of Napoleon.

70 German Empire formed.

71 William of Prussia, Emperor.

71 Italian Government transferred to Rome.

71 Commune and Repubilc in France.

71 Great Fire in Chicago.

72 Oscar II. made King of Sweden

72 Carlist War in Spain.

72 Geneva award on the Alabama Claims.

73 Death of Napoleon III. in England.

73 Abdication of King Amadeo of Spain, a Republic proclaimed.

75 Alfonso, Prince of the Asturias, King of Spain.

1875 to 1885 A. D.

76 Centennial celebration in Philadelphia.

76 Queen Victoria, Empress of India.

76 Conquest of China by Russia.

77 R. B. Hayes, President, of the U. S.

77 War between Russia and Turkey.

77 Great Fire at St. John New Brunswick.

78 War in Afghanistan.

78 Death of Victor Emmanuel, and Humbert made King.

78 Pius IX. dies, and Leo XIII. made Pope.

78 Treaty of Berlin.

78 Montenegro Independent.

78 Roumania Independent.

78 Servia a Free State.

78 Yellow Fever Epidemic in U. S.

78 Marquis of Lorne Viceroy in Canada.

79 Zulu War.

79 Jules Grevy, President of France.

79 Queen Mercedes of Spain dies.

79 War between Chili and Peru.

80 Famine in Ireland.

80 Slavery abolished in Cuba.

81 James A. Garfield President, U.S., killed and succeeded by Chester A. Arthur.

81 Alexander II. of Russia assassinated.

81 Greely North Pole Expedition,

82 War in Egypt by England

83 Brooklyn Bridge opened.

83 Indian War.

84 Dynamite Explosion at Quebec.

85 Grover Cleveland President, U. S.

85 Rebellion Louis Riel, Canada.

1885 to 1890 A. D.

86 Labor Agitation in the U. S.

86 Anarchist Riot in Chicago.

86 Louis Riel hanged in Canada.

87 Sadi Carnot, President of France.

87 Stanley penetrates the heart of Africa, gone two years.

88 William I. of Germany dies, Son, Frederick III., succeeds. Dies soon after and his Son William II. made Emperor of Germany.

88 Lord Sackville British Minister dismissed from Washington.

88 Canadian Fisheries Treaty rejected by the U. S.

88 Lord Stanley Gov. General of Canada.

89 Dom Pedro, Emperor of Brazil, deposed.

89 Civil War in Hayti.

89 Benjamin Harrison, President, U. S.

89 Great Fire in Quebec.

89 Boulanger excitement in France.

89 Mining strikes in Germany.

90 Heligoland transferred to Germany.

90 De Castillo, Premier of Spain.

90 Duke of Orleans banished from Paris.

90 Death of Sitting Bull. End of Indian outbreak.

90 11th Census of the United States.

90 McKinley Tariff goes into effect

1890 to 1895 A. D.

91 Balmaceda, President of Chili deposed.

92 Birth of People's Party at Omaha

93 Socialistic gains in Germany.

93 Cleveland, President 2nd term.

93 Home Rule bill passed House of Commons. Defeated in House of Lords

93 War between Spain and the Moors.

93 World's Fair at Chicago.

93 Financial depression in U. S.

93 Congress of Religions Chicago

93 Revolutions in Brazil and Argentine Republic.

93 Sherman Bill repealed.

93 Attempt to assassinate Emperor of Austria.

94 President Carnot of France assassinated.

94 Nicholas II. Czar of Russia.

94 War between China and Japan.

94 Great Coal and Rail Road Strikes in United States.

95 Norway adopts Universal Male Suffrage.

95 Armenians Massacred by the Turks.

95 Venezuelan Boundary Dispute.

95 Free Silver Movement in United States.

95 Felix Faure, President of France.

95 Cuban Revolt against Spain, War of Independence.

1895 to 1907 A. D.

96 Nicholas II, Russia, Crowned.

96 X-Ray discovered.

97 War between Greece and Turkey.

97 Gold discovered in Klondike.

98 Spanish American War.

98 Universal Peace Conference, the Hague.

98 South African War begins.

98 Venezuelan Boundary dispute settled.

00 World's Fair at Paris.

00 King Humbert of Italy assassinated. Victor Emmanuel III, succeeds.

00 War of the Nations against China.

01 Death of Queen Victoria.

01 Edward VII. King of England.

01 Queen Wilhelmina of Holland married.

01 President McKinley assassinated.

02 Leo XIII's Jubilee.

02 Alphonso XIII King of Spain.

02 Cuba becomes a Republic.

02 Boer War ends.

02 Mt. Pelée Eruption, kills 30,000

03 Pope Leo XIII dies; Pius X succeeds.

03 Republic of Panama recognized

04 Panama Canal begun.

04 Russo - Japanese War.

04 World's Fair at St. Louis.

04 Great Fires in Toronto and Baltimore.

05 Roosevelt inaugurated Pres't.

05 Roosevelt's influence ends Russian Japanese War.

06 San Francisco earthquake and fire.

06 King Alfonso of Spain married.

06 Norway and Sweden separate.

07 Jamaica earthquake.

BOOK IV

THE HOME CYCLOPEDIA

OF

COOKING AND HOUSEKEEPING

A BOOK OF PRACTICAL RECIPES FOR THE KITCHEN, FOR THE NURSERY, FOR THE SEWING-ROOM—HOW TO MAKE DELICIOUS DISHES FOR THE TABLE—USEFUL RECIPES FOR THE CARE OF FURNITURE AND CARPETS, CLOTHING AND HOUSE UTENSILS—SUGGESTIONS FOR HOME DECORATION AND THE CARE OF FLOWERS AND PET ANIMALS.

A MODEL COOK BOOK

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AND WITH

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THE ART OF COOKING

The section of the house which is most rarely seen by the visitor is the one which is most necessary to his comfort and that of the family. While the drawing-room, the library, the dining-room, and other apartments contribute their share to the enjoyment of life, the kitchen and its products are essential to existence itself. Whatever, therefore, it may be felt important to say about the arrangement and adornment of the rooms most in evidence in the well-ordered household, in all accounts of family life a large space needs to be devoted to the kitchen, that reservoir from which flows an endless succession of palatable viands, which have much to do with making life worth living. Of the time at our command a considerable portion is spent at the table; eating and drinking occupy a large place in our thoughts, and, while conscious that we must eat to live, we do our utmost to make the act of eating one of the chief enjoyments of life.

For this the art of the cook is all essential. Nature offers us a great variety of foods, and man has learned how to combine and develop these into hundreds of palatable dishes. They can be spoiled; nothing is more easy. They can be rendered unnutritious and distasteful by careless or ignorant handling. On the other hand, by the exercise of skill and care, they can be made nutritious, toothsome, often delightful to the palate, and the task of sustaining life can be converted into one of the leading pleasures of existence. How this may be done it is proposed to show in the following pages, by giving a collection of practical recipes for the preparation of food. In this it has been our purpose to combine economy with palatableness. Many of the recipes given in cook-books are so lavish in the use of butter, eggs, and other costly ingredients as to place them beyond the reach of ordinary families. This we have endeavored to avoid, and have also taken care to submit all our recipes to the inspection of experienced housewives, giving none which have not received the verdict of approval.

Man is omnivorous in appetite. He is at once a carnivorous and a herbivorous animal. A due combination of meats and vegetables forms the basis of our meals; followed, when appetite is stayed, with delicate and tasteful viands, in which all the art of the cook is enlisted to make them delicious. In ordinary dinner service it is customary to begin with soup, and follow with fish, meats or game, accompanied with vegetables, and proceed to a dessert of pies or puddings, cake, fruit, and other stays to the failing appetite. In arranging our recipes

we have followed in general this order, beginning with soups and proceeding through the solid courses to the dessert.

The Kitchen Fire.

To make a fire in a stove or range, take off the covers, brush out the ashes and knock all clinkers from the sides of the fire box. Open all the dampers. Bring shavings or paper, wood and coal. Cover the grate with shavings or loosely crumpled pieces of paper. Lay in crosswise small pieces of wood, and on top of these larger pieces, being careful to fill all the corners of the fire box. Leave spaces between for the passage of air, and light the fire from underneath.

When the wood begins to burn put on coal, pressing the wood down to the grate. Add more coal after the first supply kindles. As soon as the fire burns freely close the back damper, and when the oven is hot close the front damper. Never allow the coal to come above the edge of the fire box.

Every stove or range has, at least, two dampers; one to allow the air to pass up through the fire, another to allow the gas to escape up the chimney and to complete the circulation of air. When the oven is to be used, the dampers should be so regulated as to allow the heated air to pass around the oven.

In making a fire one thing should be borne strictly in mind. Never pour coal-oil on the kindling to make it burn more freely or on the fire to give it new life. If you have it in view to do this you had better take poison at once, and avoid the more painful suicide of burning to death, which has been the fate of so many who had the habit of using this dangerous material.

To keep the fire over night, close the front damper and leave the back one partly open; put on fresh coal and after it has kindled open the cooling doors to admit cold air over the fire.

The stove is blackened to make it look well, to prevent it from rusting and to keep in the heat. Moisten the blacking with warm or cold water, making a paste about as thick as cream. Rub this over the stove while it is cold and polish with a soft brush after the fire is kindled.

Soups and Their Preparation.

In making soup uncooked meat should always serve as the basic element. Cracked bones of cooked game or of rare beef and mutton may be added if desired, but the juices derived from raw meat can alone be depended upon for nourishment and flavor. The meat should be chopped fine, and then placed in cold water and allowed to soak for some time. If bones are used they should be thoroughly fractured. Heat should next be gradually applied and the water slowly brought to a boil. At no stage must it be allowed to boil fast. Salt has a tendency to harden the fibres and check the flow of the juices, and therefore should not be added till the meat is thoroughly done. While boiling, keep the pot covered. When done, strain through a cullender; and afterwards, for clear soup, through a hair sieve, or coarse bobbinet lace.

Let the tureen be kept covered until you are ready to serve the soup; then ladle it out quickly and neatly, having the soup-plates warmed in advance. In most cases soup is better on the second than on the first day; but it should not be warmed over too quickly, or left too long upon the fire after heating.

If the object be to obtain stock for soup, boiling must be kept up for some time, so as to obtain from the meat all its gelatine, so far as possible. The hardened albuminous matter which floats in the liquid can be removed by straining, so as to leave the soup clear. There will remain in the vessel a dry fibrous mass without taste and of little nutritive value.

Soup is often looked upon as a light kind of food—useful only as a preliminary to other foods; but in many countries it is the staple article of diet. There is no better way of economizing food. All the waste fragments of the table may be made available in this way. The French peasant has his "*pot-au-feu*" always ready to receive anything from which nutriment can be extracted, and makes his soup, with the addition of bread, his main sustenance.

Soups may be made alike from meats and vegetables, from shell-fish and game, and are capable of being very widely varied.

We give below recipes for preparing some of the more desirable kinds:

Beef Soup.—Select a shin of beef of five or six pounds' weight, crack the bone, thoroughly wash and place it in a kettle to boil, with five or six quarts of cold water. Let it boil very slowly for about six hours. In this way the stock is prepared, which may be set away for use the next day. Set it on an hour before dinner, add salt and pepper, and one carrot, two turnips, two tablespoonfuls of rice or pearl barley, one head of celery and a teaspoonful of summer savory powdered fine; the vegetables to be minced up in small pieces. After these ingredients have boiled a quarter of an hour, put in two potatoes cut up in small pieces; let it boil half an hour longer, take the meat from the soup, and, if intended to be served with it, take out the bones and lay it closely and neatly on a dish, and garnish with sprigs of parsley.

The seasoning of this soup is a matter of taste. Some use only salt and pepper, others put in a little mace and some small herbs. Serve very hot.

To make a simpler stock omit the spices and herbs, also the vegetables.

Veal Soup.—Put a three-pound knuckle of veal into three quarts of cold water, with salt and one small tablespoonful of uncooked rice. Boil slowly for three hours, or until the liquor is reduced to half its original quantity; remove from the fire. Into the tureen put the yolk of one egg, and stir in a teacupful of cream, or new milk; add a small piece of butter; on this strain the soup, boiling hot, stirring it all the time.

Chicken Cream Soup.—Take two young or one full-grown chicken. Cut it into pieces and put these into a soup kettle with half a pound of ham, and an onion; add four quarts of cold water. Bring slowly to a gentle boil, and keep this up until the liquid has diminished one-third, and the meat drops from the bones; then add half a cup of rice. Season with salt, pepper, and a bunch of chopped parsley.

Cook slowly until the rice is tender, then the meat should be taken out. Now, stir in two cups of rich milk thickened with a little flour. A chicken at least a year old is better for soup than a younger fowl.

Mutton or Lamb Broth.—Take four pounds of lean mutton or lamb, and cut into small pieces, which boil slowly in a gallon of water, in a covered vessel, for two hours. Soak a half teacupful of rice in enough warm water to cover it, and add to the boiling soup. Cook another hour, stirring from time to time, to keep the rice from settling to the bottom.

Beat an egg to a froth, and stir into it a cup of milk, into which has been rubbed a tablespoonful of flour. Mix with this a little of the hot liquid, until the egg is cooled sufficiently to prevent danger of curdling. Then, after taking out the meat, pour this into the pot, season with parsley, thyme, salt and pepper; let boil and serve.

This soup is nutritious and palatable for the sick with the rice left in. When strained it makes an excellent white table soup.

Mock Turtle or Calf's Head Soup.—Scald a well-cleaned calf's head, remove the brain, and boil the head until the meat will easily slip from the bone. Then take out the head; cut it in small, square pieces, and throw them into cold water; when cool, put it into a stewpan, and cover with some of the broth; boil until quite tender, set aside.

In another stewpan melt some butter, and in it put a quarter of a pound of lean ham, cut small, with herbs, also parsley and one onion; add about a pint of the broth; let it simmer for two hours, and then dredge in a small quantity of flour; add the remainder of the broth, and a glass and a half of Madeira or Sherry wine; let all stew quietly for ten minutes and rub it through a medium sieve; add the calf's head, season with a very little cayenne pepper and a little salt.

Having previously prepared force-meat balls, add them to the soup, and serve hot. Serve with sliced lemon, which may be laid on top of the soup, or passed separately.

Force-Meat Balls for Soup.—The force-meat balls, mentioned in the preceding recipe, may be thus made. Take one cupful of cooked veal or fowl meat, minced; mix with this a handful of fine bread-crumbs, and the yolks of four hard-boiled eggs

rubbed smooth together with a tablespoonful of milk; season with pepper and salt; add a half teaspoonful of flour, and finish with two beaten eggs; the hands must be well floured, and the mixture be made into little balls the size of a nutmeg; drop into the soup twenty minutes before serving.

Ox Tail Soup.—Boil two ox tails three to four hours, season with salt, black pepper and a small piece of ripe pepper pod. Add one-half cup barley, previously soaked in cold water three hours, a cup of tomato juice and a little carrot finely chopped. Boil all together one hour and serve hot.

Vermicelli Soup.—Take four pounds of lamb, removing all fat, one pound veal and a slice of ham, cut up, cover with a quart of cold water, and let it heat slowly. Keep it closely covered. After an hour, add four quarts of boiling water, and cook till the meat is in shreds. Then season with salt, herbs, and a little Worcestershire sauce, boiling for ten minutes in the soup. Then strain and set again on the fire. Now add about the third of a pound of vermicelli which has been boiled tender. Boil up once, and serve. Macaroni may be used if preferred to vermicelli.

Philadelphia Pepper Pot.—Put two pounds of tripe and four calves' feet into the soup pot and cover them with cold water; add a red pepper, and boil until the calves' feet have become very tender. Then take out the meat, skim and stir the liquid, and cut the tripe into small pieces, which put back into the liquid. If there is not enough of this add boiling water. Flavor with half a teaspoonful of sweet marjoram, sweet basil, and thyme, two sliced onions, sliced potatoes and salt. When these have boiled until almost tender, add a piece of butter rolled in flour, drop in some egg balls, boil fifteen minutes more. Serve hot.

Noodles for Soup.—Beat up one egg light, add a pinch of salt, and flour enough to make a *very stiff* dough; roll out like thin pie crust, and dredge with flour to keep from sticking. Let this dry for an hour or more; then roll it up into a tight scroll, and slice it into thin pieces. After all are cut, mix them lightly together, and, to prevent them sticking, keep them floured a little until you are ready to drop them into your soup. This should be done 15 minutes before serving, for if boiled *too long* they will go to pieces.

Fish Soup.—Select a large, fine fish, clean thoroughly, and put over the fire in water, allowing one quart for each pound of fish. Add an onion cut fine, and a bunch of sweet herbs. When the fish is cooked, and is quite tasteless, strain all through a cullender, return to the fire and add some butter; then salt and pepper to taste. A small tablespoonful of Worcestershire sauce may be added. Serve with small squares of fried bread and thin slices of lemon.

Oyster Soup.—Strain the juice from two quarts of oysters, add to it a teacupful of water, and heat slowly in a covered vessel. When near boiling, season with salt and pepper, add the oysters, and let them stew for about five minutes. Heat in a separate vessel a quart of milk with two tablespoonfuls of butter, pour in, and stir well for two minutes.

Be very careful that the soup is cooked just enough. Too much cooking ruins the oysters, while they are equally ruined for the taste by being underdone. The plumpness of the body and the ruffling of the edge are indications of their being in the right condition. Serve with sliced lemon and oyster or cream crackers. Mace and nutmeg may be used for seasoning.

Oyster Bouillon.—Wash and chop fifty good-sized oysters, put them in a double boiler, cover and cook slowly for an hour; add a pint of water, a level teaspoonful of celery seed, and strain through two thicknesses of cheesecloth; reheat, add a level tablespoonful of butter, a little salt, and serve in cups.

Clam Soup.—Take twenty-five clams, and chop fine. Put over the fire the liquor that was drained from them, pour in a cup of water, and let boil ten minutes; then add the chopped clams, and boil half an hour. Season to taste with pepper and salt and two tablespoonfuls of butter; let it boil again and add one quart of milk heated to scalding, stir in a tablespoonful of flour made

to a cream with a little cold milk, or two crackers rolled fine. Some like a little mace and lemon juice in the seasoning. Serve without delay.

Green Turtle Soup.—Chop the coarser meat of the turtle, with the bones, add four quarts of water, with salt, pepper, two onions, and a bunch of sweet herbs. Stew slowly for four hours, keeping it at a boil. Then strain the soup, and add the finer meat and the green fat of the turtle, which have been simmering for an hour in a quart of water. Thicken with brown flour and boil for an hour more. If there are turtle eggs, boil them separately for four hours, then throw into the soup. Use force-meat balls if there are no eggs. Then put in the juice of one lemon and a glass of Madeira wine. Beat up once and pour out. Any private family can now obtain green turtle meat for soup, it being preserved in air-tight cans.

Chicken Soup.—Prepare a fowl for cooking. Separate it at the joints and cut it into small pieces. Put the meat into a saucepan with three pints of water and cook it slowly from 2½ to 3 hours, or until very tender. Then take out the meat, let the liquor continue to boil, and to it add two tablespoonfuls of rice, two tablespoonfuls of finely cut onion, which has been fried in a little butter until soft, but not brown, and three peppercorns. Remove the gristle from the meat and put the meat, with one teaspoonful of salt, into the soup, and simmer until the rice is very soft. A little white pepper and celery salt may be added, if desired. If the water boils away during the cooking, add more boiling water. Serve the soup with croutons.

Croutons.—Cut slices of stale bread ½ inch thick. Cut off the crusts and divide the slices into ½ inch cubes. Place them on a tin sheet and bake them until golden-brown. Serve with stews and soups.

Vegetable Soup.—Scrape one small carrot and pare one small turnip, removing a thick skin. Grate and add them to one cup of soup stock and let it simmer 45 minutes. Pare one potato, cut it into small cubes and add it to the stock after the turnip and carrot have cooked 15 minutes. Add some tomato, if desired. The soup may be varied by using rice or noodles with the stock, instead of vegetables.

Thick Vegetable Soup.—Put 1 lb. shin bone into one pint cold water with one-half teaspoonful each of salt and sugar, let it simmer. Brown two sliced onions in one tablespoonful of butter, stir in an equal quantity of flour and brown it; add one cup boiling water gradually, and, when the mixture is smooth and thick, stir it into the soup. Cut two carrots and two turnips in small squares, and some celery in ½ inch strips, and add them. Simmer two hours. Three-quarters of an hour before serving slice two potatoes, parboil 5 minutes, and add them and one-half teaspoonful of pepper. One tablespoonful of chopped parsley may be added just before serving. Remove the bone, separate the meat, if there is any, into small pieces, and serve in the soup. Do not put any fat meat into the soup.

Green Pea Soup.—Put the empty pods of a half peck of peas into a gallon of water, and boil for an hour. Then strain, put in four pounds of chopped beef, and boil slowly an hour and a half. Then add the peas; boil half an hour, adding ten minutes before serving a half cup of rice flour, salt, pepper, and chopped parsley. Strain into a hot tureen.

Dried Pea Soup.—One gallon of water, one quart of soaked peas; boil slowly for two hours. Then press the peas through a cullender with a wooden spoon, and return to the pot, adding a small head of celery, chopped, and a little parsley or summer savory. If the soup becomes too thick add more water. Place in the bottom of the tureen small pieces of toasted bread, or scatter bread that has been fried in butter until brown on the surface of the soup, after it has been poured into the tureen.

Pea Porridge.—Shell the peas and put the pods on to boil, cooking about an hour. Drain off the water, and put it over the fire; add the peas, some potato cut in small pieces, a bunch of pot-herbs, and a small onion. When these are well cooked add a quart of milk, and thicken with flour and butter rubbed together, and salt and pepper

to taste. Small dumplings are an addition, if liked.

Bean Soup.—Cook three pints soup or marrowfat beans, with one and one-half pounds of fresh pork. When done remove the meat. Take out a dish of beans to serve for dinner. Take a pint of beans and run them through a sieve. Have as much water as necessary, for the amount of soup desired to make, add the pulp and a tablespoonful of butter, make thickening of one tablespoonful of flour and one-half cup sweet milk, one well-beaten egg, and one onion cut fine.

Black Bean Soup.—Take one cup black beans, soak several hours or over night; put to boil in one quart cold water. Slice half a small onion, and fry it in a tablespoonful of butter. Add it to the beans, and simmer four or five hours, or until the beans are soft, adding cold water so as to keep the quantity one quart. Cook together one tablespoonful each flour and butter, and add to the soup after it is strained. Season with a tablespoonful salt and a sprinkle of pepper and mustard. Any other dried beans may be used in making this soup.

Corn Soup.—Stew one-half can or two cups corn with one-half cup water until soft. Scald one pint milk, with salt and pepper added, in the top of a double boiler; add one-half tablespoonful of sugar. Pour in the corn, and strain it if desired.

Chicken Corn Soup.—Take a large chicken, cut into pieces, and boil with the cobs of the corn in a gallon of water till tender. Then put into the pot the green corn cut from a dozen ears, and stew gently for an hour longer. Remove the chicken and the cobs, season the soup with pepper, salt, and parsley, thicken with rice or wheat flour, boil up again, and serve. There is no need to strain if the corn is young.

The chicken, unless boiled to rags, may be served in a fricasee. For this, beat up an egg and a tablespoonful of butter, adding some liquor from the soup, and boil for a moment. Thicken with flour, season, and pour hot over the chicken. Garnish dish with parsley and slices of hard-boiled egg.

Graham Soup.—Chop up finely three onions, three carrots, four turnips, and a bunch of celery. Put on the fire in about three quarts of water. Simmer half an hour, then add a small cabbage, which has been parboiled and cut up. In fifteen minutes more put in a pint of stewed tomatoes and a bunch of sweet herbs, and boil briskly for twenty minutes. Then rub through a cullender, and boil again, adding pepper and salt and a tablespoonful of butter. Some cream, thickened with corn starch, may be added, if convenient. Give it a brief boil, and it is ready to serve.

Tomato Soup.—Stew a quart of peeled tomatoes until soft, strain, and add a pinch of soda. Set over the fire again, adding a quart of hot milk; season with salt and pepper, a piece of butter the size of an egg, and three tablespoonfuls of rolled cracker, and serve hot. Canned tomatoes may be used in place of fresh ones.

Potato Soup.—Three potatoes, one and one-half cups water, three cups milk, one onion, three teaspoonfuls salt, one and one-half tablespoonfuls flour, one and one-half tablespoonfuls butter. Boil potatoes until soft, drain and mash them. Cook the onions in the milk; add this to the mashed potatoes, add the salt and pepper. Melt the butter in a pan, add flour, add this to the soup, let boil up once, strain and serve hot.

Cream of Tomato or Mock Bisque Soup.—Stew one can tomatoes until soft, strain, and add one-half teaspoonful soda. Melt three tablespoonfuls butter in a saucepan, and stir in two tablespoonfuls flour. Cook it, stirring until the flour swells and is smooth. Pour in one quart scalded milk gradually and cook, stirring constantly, until the mixture thickens; add one teaspoonful salt and one-eighth teaspoonful pepper. Add the tomato, and serve immediately in a hot covered dish. If the soup curdles, beat it with an egg-beater until smooth.

Fish.

The variety of edible fish is very considerable, most of them being wholesome and nutritious. Yet white-fleshed and red-fleshed fish, oily fish, shell-fish, etc., differ widely in their properties. In general, fish contain less fat than ordinary meat, while

ROAST TURKEY.

Remove tendons from the legs, singe and draw the turkey; remove pin-feathers, wash and dry carefully; fill with stuffing if desired; cover the breast with thin slices of salt pork, scored lightly and fastened in place with strings or small skewers, and set on the rack of a baking pan into a hot oven. Turn the bird often that the heat may sear over the outside uniformly and thus keep the juices within. When this has been accomplished, that is, in about fifteen to thirty minutes, add a little hot water and drippings to the pan and as soon as possible reduce the temperature to that of ordinary baking. Baste every ten minutes, dredging with flour after each basting. When half cooked add salt to the flour. When the joints will separate easily, the cooking is completed. Three hours are required to roast a ten-pound turkey. When the fowl is nearly cooked, remove the pork from the breast, baste with a little butter melted in hot water and return to the oven for final browning; baste several times or until the desired color is attained. Garnish with water cress, cover the ends of the drum sticks with paper frills. Serve, at the same time, Giblet Sauce made of the browned flour in the pan, additional flour if needed, the water in which the giblets were cooked, and the giblets chopped, but not too fine. In America cranberry sauce accompanies this roast; in England gooseberry sauce is in evieence.

CHICKEN AND SWEETBREAD CROQUETTES.

Add to a sweetbread cooked, cooled and chopped, not too fine—enough chopped chicken to make one pint in all. Melt one-fourth a cup of butter, add half a cup of flour and cook until frothy; then add gradually, stirring constantly, one cup of chicken stock, well seasoned with vegetables and sweet herbs, and one-third a cup of cream. Season to taste with salt and pepper; add one egg, well beaten, and the chopped meat. Set aside to become cold, then shape, apply egg-and-bread crumbs, and fry in deep fat; drain on soft paper. Serve with mushroom sauce in a boat.

often much richer in nitrogenous tissue. The suitability of fish for the table varies with the season, its food supply, the length of time it has been taken out of the water, and the treatment it has received. It is in the highest condition just before the spawning time, being then fatter and of richer flavor. Herring, mackerel, and many other fish are best immediately after being caught, while the ray and some similar fish improve by keeping for several hours.

As a rule, white fish are more digestible than red fish, and the less oily than the very oily. Among those best suited for weak stomachs are fresh-water fish, such as shad, whiting, etc. Salmon, while the most esteemed of table fishes, has an evil reputation with dyspeptics—this being probably due less to the fish itself than to its condition when cooked and its accompaniments.

Fish of all kinds should be eaten as fresh as possible, and should be kept near the ice until cooked. A fish in good condition should have firm flesh, bright-red gills, and full, clear eyes, with little odor about it. Before cooking it should be thoroughly cleaned and wiped with a cloth wet with salt water. For frying and broiling purposes oily fish, such as shad, mackerel, herring, salmon, and bluefish, are the best, as they do not become dry.

Fried Fish.—Most of the smaller fish are eaten fried. They are generally termed pan-fish. Clean well, cut off the head, and, if the fish is large, cut out the backbone, and slice the body crosswise. Season with salt and pepper. Dip in Indian meal, or wheat flour, or use beaten egg and roll in bread or fine cracker crumbs (trout and perch should not be dipped in meal). Cook in a thick bottomed iron frying-pan, laying the flesh side down, and using hot lard or drippings. Fry slowly, turning when lightly browned.

Steamed Fish.—Bend the body of the fish in a circle, pour over it half a pint of vinegar, season with pepper and salt, and let it stand an hour in a cool place. Then pour off the vinegar, and put the fish into a steamer over boiling water, and steam twenty minutes, or longer for large fish. When the meat easily separates from the bone it is done. Drain well, and serve on a napkin placed on the platter, decorating with sprigs of curled parsley.

Broiled Shad.—Split and wash the shad, and dry it in a cloth. Season with salt and pepper. Grease the gridiron well, heat it, and lay the shad upon it, the flesh side down. Cover with a dripping-pan and broil for about a quarter of an hour, or more, according to the thickness. The fire must be clear and hot. Butter well, and send to the table. Covering the fish while broiling gives it a better flavor.

Broiled Salmon.—Cut into slices an inch thick, and season with pepper and salt. Having buttered a sheet of white paper, lay each slice on a separate piece, and envelope them by twisting the ends. Broil gently over a clear fire, and serve with anchovy or caper sauce. When higher seasoning is required, add a few chopped herbs and a little spice.

Boiled Fresh Codfish.—Before cooking, soak in slightly salted water for half an hour. Then wipe dry, and wrap in a linen cloth, dredged with flour, and sew up the edges. Put into the kettle, with plenty of hot water, and boil briskly, allowing fifteen minutes for each pound. The fish is sufficiently cooked when the flesh separates from the bone.

The sauce is prepared by stirring into two gills of boiling water and milk two tablespoonfuls of butter, rolled in flour, and adding, as it thickens, two beaten eggs. Season with salt and parsley, and, on withdrawing from the fire, add pickled nasturtium or celery seeds. Put the fish in a hot dish and pour the sauce over it. Garnish with parsley and circles of hard boiled eggs.

Rock fish and bass may be cooked in the same manner, but will need less boiling.

Shad Roe.—Drop into boiling water and cook for twenty minutes. Take from fire. Butter a tin plate and lay the roe on it; dredge with salt and pepper and spread with butter, then dredge with flour; cook in oven for half an hour. Baste frequently with salt, pepper, butter, flour and water.

Salt Codfish Balls.—Soak shredded codfish in cold water about ten minutes and drain. Add an equal amount of mashed

potatoes, a small piece of butter and one egg well beaten. Mix thoroughly and shape into balls or cakes, first flouring your hands. Fry in smoking hot fat.

Fishballs, oysters, and croquettes should be fried in a bath of smoking hot fat. Melt the fat (olive oil, lard, cottolene, or beef dripping) in a deep pot, and when it begins to smoke, drop in a small cube of bread. If in forty seconds the bread browns, the fat is hot enough for frying cooked foods, such as fishballs and croquettes, or foods which need little cooking, such as oysters. All fried foods should be drained on soft brown paper. Care should be taken not to cook too much food at one time, because the cold food lowers the temperature of the fat and thus makes the food greasy. The fat may be strained and used many times.

Codfish Balls.—To make these, prepare the fish as for boiling. Cut into pieces and boil twenty minutes. Pour off the water, cover again with boiling water, and boil twenty minutes more. Then drain and lay out to cool. When cold, pick to pieces with a fork, leaving only the flesh, and shredding it fine. Add an equal bulk of mashed potatoes, and work into a stiff batter with the aid of butter and sweet milk. Make the mixture into balls or cakes, first flouring your hands. Fry in smoking-hot lard to a light brown. Or use the cod and potatoes alone, molding into the shape of biscuits.

Baked Shad.—In the opinion of many people, the best way to cook a shad is to bake it. For this, fill it with bread-crumbs, salt, pepper, butter, and parsley, and mix this up with the beaten yolks of eggs. Then sew it up or fasten a string around it. Pour over the fish a little water and some butter, and bake as you would a fowl. An hour or more will be needed to bake. Garnish with slices of lemon, water cresses, etc.

Boil up the gravy in which the shad was baked, put in a teaspoonful each of catsup and brown flour, the juice of a lemon, and a glass of sherry or Madeira wine. Pour on the shad as a dressing. Serve in a sauce-boat or suitable dish.

Baked Whitefish.—Clean the fish and cut off the head, if preferred; cut out the backbone to within two inches of the tail, and stuff the fish with the following mixture: Soak stale bread in water; fry in butter a large onion, and chop fine; add the bread, squeezed dry, two ounces of butter, and salt, pepper, and a little parsley or sage; heat through, take off the fire, and add the yolks of two well-beaten eggs. Sew the fish, when filled, with fine twine, and wrap with several coils of white tape. Rub it over slightly with butter, cover the bottom of a baking pan with hot water, and place the fish in it, back upward. Serve with the following dressing: Reduce the yolks of two hard-boiled eggs to a smooth paste with two tablespoonfuls good salad oil; stir in half a teaspoonful English mustard, and add pepper and vinegar to taste.

Baked Salmon.—Clean, wipe dry, and rub with salt and pepper. Then lay the fish on a grating over your baking-pan, and roast or bake, basting at first with butter, and afterwards with its own drippings. If browning too fast, cover with a sheet of white paper until the whole is cooked. Then put in a hot covered dish, and add to the gravy a little hot water thickened with flour, a large spoonful of strained tomato sauce, and the juice of a lemon. Let this boil up, and serve in a sauce-boat. If you prefer, you can serve with cream sauce.

Stewed Catfish.—Skin, clean, and cut off the heads. Sprinkle with salt, and lay in a cool place. Then cover with cold water in a saucepan, and stew gently for thirty or forty minutes, according to size. Add a small onion, chopped, some dropped parsley, pepper, and a paste made of flour and butter. Boil up, take out the fish, and lay in a deep dish, pouring the gravy over the fish. Serve in a covered dish.

Fried Catfish.—Prepare as above. Beat two or three eggs, in which dip the fish, and then dip into powdered cracker. Fry quickly in hot lard or dripping. Serve as soon as done.

Boiled Salmon Trout.—Clean, wash, and dry the fish. Wrap in a thin cloth, cover with salted water, and boil gently for half an hour, or longer for large fish. When done, remove the cloth and lay in a

hot dish. Pour over it cream sauce and serve. The cream sauce is made of a cup of cream, diluted with a few spoonfuls of hot water, stirring in two tablespoonfuls melted butter and some chopped parsley.

Fried Trout.—Brook trout are usually served fried. After cleaning and drying, roll in flour, and fry in butter, or butter and lard. Let the fat be hot, fry to a delicate brown, and serve instantly. Use no seasoning except salt. Lay on a hot napkin, to absorb any external grease, and range side by side in a heated dish.

Canned Salmon.—Canned salmon may be served cold with any of the fish sauces. For a breakfast dish it may be heated, seasoned with salt and pepper and served on buttered toast, with a dressing of milk thickened with butter and flour poured over it.

Breakfast Mackerel.—Soak the fish over night, next morning put in a skillet in cold water. Let come to a boil and pour off water, add more and let come to a scald; take up, spread over with butter, dredge with flour and set in oven to brown.

Terrapin.—Cut off head and dress. Boil till tender with a little salt and a pinch of soda added to the water. When tender take from water and pick to pieces, add a few cracker crumbs, one onion, parsley, allspice, salt and pepper, add two tablespoonfuls of butter. Boil liquor down, pour over fish; garnish with slices of lemon and bake a light brown.

Mock Terrapin.—Take half a calf's liver, season and fry brown. Hash it not very fine; dredge thickly with flour; take one teaspoonful of mixed mustard, a pinch of cayenne pepper, two hard-boiled eggs chopped fine, a piece of butter size of an egg, one teacup of water. Boil together a minute or two and serve.

Turtle.—Cut off the head, and scald, scrape and clean thoroughly. Put on to boil, shell and all, add salt and pepper, and cook until very tender, pick meat from shell, season with butter, and thicken with a tablespoonful of flour and a little milk.

Fried Eels.—After cleaning the eels well, cut in pieces about two inches long, wash them and wipe them dry, roll them in flour or crackers, fry in hot lard. They should be browned all over and thoroughly done.

Fish Chowder.—Take 1 lb. cod or haddock; put the head, bones, fins and skin into one cup cold water and let simmer. In one tablespoonful of dripping brown one small onion. Pare and slice two potatoes and parboil five minutes. Strain the fish bones from the water, add the potatoes, scrape in the browned onion, and add salt and pepper. Bring to a boil, then add the fish, cut into inch pieces; simmer from ten to twenty minutes, or until the fish and potatoes are done. Take two tablespoonfuls each of flour and butter and one cup of milk, and cook together to make a white sauce; add it to the chowder, boil, and add two crackers broken into quarters. Serve in a hot dish.

Fish Sauce.—Put four tablespoonfuls butter into a saucepan, and cook in it the same measure of flour. Add two cups boiling water, milk or fish-stock, four tablespoonfuls of butter, and season with salt and pepper. Boil five minutes and serve. This is often called drawn-butter sauce. To make egg sauce add to above two or three chopped hard-boiled eggs.

Shell Fish.

Of shell-fish the oyster is the general favorite among epicures and everyday people alike. It is more wholesome eaten raw than when cooked, the flesh being coagulated and hardened by cooking. The least digestible part is the firm hard section of muscle, by which the animal was fastened to the shell. Persons of weak digestion should reject this portion. The clam, while it may be made into various palatable dishes, is much tougher and less digestible than the oyster. As regards the crab and lobster, they are favorite epicurean dishes, but not from their digestibility, since they are unfitted for weak stomachs. Many persons of fairly good powers of digestion find the crab or lobster a heavy load upon the stomach.

Fried Oysters.—Remove all bits of shell from oysters, lay them on a clean cloth, and pat them gently to dry them. Shake salt and pepper over them. Beat an egg, and stir

into it one tablespoonful cold water or milk. Sprinkle some fine crumbs with salt and pepper. Dip the oysters in the crumbs, then in the beaten egg, and again in the crumbs, covering them over each time. Fry them in deep, hot fat, drain on brown paper, and serve on a hot dish.

Fried Oysters.—Take large oysters from their own liquor, and dry them in a thickly folded napkin. Then heat an ounce each of butter and lard in a thick-bottomed frying-pan. Season the oysters with pepper and salt, and dip each into egg and cracker-crumbs rolled fine, until it will take up no more. Place them in the hot grease and fry to a delicate brown, turning them with a broad-bladed knife. Serve crisp and hot. Some roll oysters in corn-meal or flour, but they are much more crisp with egg and cracker-crumbs.

Small Oyster Pies.—Take a tin plate half the size of an ordinary dinner plate; butter it, and cover the bottom with a puff paste, as for pies. Lay on it five or six select oysters, or enough to cover the bottom; butter, and season with a little salt and plenty of pepper; spread over this an egg batter, and cover with an upper crust of the paste, piercing it with a fork. Bake in a hot oven fifteen to twenty minutes, or until the top is nicely browned. Repeat this process for each pie.

Stewed Oysters.—Drain the liquor from two quarts of oysters, mix it with a teacupful of hot water, season with salt and pepper, and boil in a saucepan. After it has come to a boil put in the oysters, and cook not over five minutes. Add two tablespoonfuls of butter, and when this is melted a cupful of boiling milk. Then take from the fire, and serve with oyster or cream crackers.

Broiled Oysters.—Let these be large and plump. Wipe dry, sprinkle with salt and red pepper, and broil on a small gridiron made for this purpose. Butter the gridiron well, and have a clear, hot fire. Broil quickly, and serve hot, with a small bit of butter on each oyster.

Brown sauce for broiled oysters may be prepared as follows: Heat a cup of oyster juice; stir two tablespoonfuls butter in a pan over the fire till it is a delicate brown; add four tablespoonfuls flour, and when well mixed add the oyster juice slowly, and then a cup of hot milk or cream. Season with salt and pepper, and keep over a pan of hot water till needed. A few cloves or a stick of mace may be used to flavor the sauce.

Scalloped Oysters.—Crush several handfuls of crackers, and put a layer in the bottom of a buttered dish, wetting it with a mixture of the oyster juice and milk. Then place a layer of oysters, seasoned with salt and pepper, another layer of moistened cracker dust, and so on till the dish is full, the upper layer being a thick one of crumbs. Stick bits of butter thickly over it, cover the dish, and bake half an hour in the oven. If not brown on top, remove the cover, and set the dish on the upper grating of the oven.

Panned Oysters.—Put the oysters into a saucepan without water, and shake them over a moderate fire until they look plump and their edges are curled. For twenty-five oysters add two tablespoonfuls butter, salt and pepper, stirring the seasoning in well. Serve in a hot dish; if desired, on slices of toast.

Creamed Oysters.—Cook as for panned oysters; drain in a strainer; make a cup of white sauce, and stir the oysters into the hot sauce. Serve on toast; or sprinkle with bread crumbs, browned in butter. For the white sauce, see *Fish Chowder*.

Creamed Clams.—Have twenty-five clams chopped fine. Put in a chafing dish two tablespoonfuls butter; when melted add two tablespoonfuls flour. Add the clams with half a pint of their juice; season well with pepper and salt. Let them simmer from ten to fifteen minutes. Just before serving add a gill of sweet cream, and let come to a boil. Serve hot.

Steamed Oysters.—Drain one quart of select oysters, put in pan and place in steamer over boiling water, cover and steam until oysters are plump with edges ruffled; place in buttered dish with butter, pepper and salt and serve.

Oyster Fritters.—To a cupful of oyster juice add one cupful milk, three eggs, a

little salt, and flour to make a thin batter. Chop the oysters and stir into batter. Place in the pan a few spoonfuls of lard, heat very hot, and drop in the batter by the tablespoonful. Take from the pan as soon as done to a yellow brown and serve very hot. Some put one whole oyster to each fritter; in this case a thicker batter is needed.

Oyster Sauce.—Boil twenty-five oysters in their own juice for one minute, stirring steadily. Drain, put back the liquor on the fire; add one cup milk, rub a tablespoonful of butter and two of flour to a smooth paste, and stir in the hot liquid till it thickens. Chop the oysters small, add them to the sauce, season with salt and pepper, and take from the fire. Serve with poultry and boiled fish.

Clam Fritters.—Take fifty small or twenty-five large clams, cut each in two if large. Lay them on a thickly folded napkin, and put a pint of wheat flour into a basin, adding three well-beaten eggs, and half a pint or more of clam juice. Beat the batter until it is smooth and perfectly free from lumps, then stir in the clams. Put plenty of lard into a thick-bottomed frying-pan, let it become boiling hot, and put in the batter by the spoonful. Fry gently, and when one side is a delicate brown, turn the other.

Clam Chowder.—For this take fifty clams, a bowl of salt pork, cut up fine, and one of onions, finely chopped, with the same or a greater quantity of potatoes cut into small pieces. Fry the pork very gently, and when brown take it out and put in the onions to fry. This should be done in a frying-pan, and the chowder-kettle be made very clean before they are put in it, or the chowder will burn. Sprinkle some of the pork in the bottom of the pot, place on it a layer of clams, seasoned with salt and pepper and covered with bits of butter. Next have a layer of onion and one of small crackers moistened with milk. On this pour some of the fat from the frying-pan, and then repeat the process, continuing till the pot is nearly full. Cover now with water and stew slowly, for forty-five minutes. Drain off the liquor that flows freely, and, after emptying the chowder from the pot, return this liquor. Thicken it with flour or cracker dust, add some wine and catsup, boil, and pour over the contents of the tureen.

Devilled Crabs.—Extract the meat from boiled crabs and mince it finely. Season well with mustard, cayenne, salt, and some sharp sauce. Toss and stir till well mixed, and cook in a covered saucepan, with just enough water to keep the meat from burning. For dressing, use pulverized cracker, moistened with a tablespoonful of cream, and with vinegar until thin. After the water has come to a boil stir this in. Next stir in a tablespoonful of butter, boil again, and take from the fire. Serve in the shell of the crab, if desired.

Lobster Croquettes.—Add pepper, salt, and powdered mace to the meat of a boiled lobster, chopped fine. Mix with this a quarter of its quantity of bread crumbs, and mold into pointed balls, with the aid of two tablespoonfuls of melted butter. Roll in beaten egg, then in cracker dust, and fry in butter or sweet lard. Serve dry and hot.

Lobster Salad.—Extract all the meat from a cold boiled lobster, and mince it, except the coral, which is reserved for the dressing. For this take four hard boiled eggs, and rub the yolks to a smooth paste in a bowl or mortar, gradually rubbing in two tablespoonfuls salad oil, and one teaspoonful each of mustard, salt, white sugar, cayenne pepper, and Harvey's or other sauce. Lastly add the coral, which must be worked well upon a plate with a spatula. Moisten with vinegar as the ingredients stiffen, adding until the mixture is thin enough to pour over the minced lobster. Toss with a silver fork, taking care not to break the meat. Chopped lettuce may be mixed with the salad. Garnish the dish around its edges with curled lettuce, or rings cut from the white of the boiled eggs. Lobster salad should be eaten soon. It becomes unwholesome if it stand long.

Broiled and Baked Lobsters.—Lobsters which are to be broiled or baked are killed by cutting them into halves; the stomach and long intestine are then re-

moved, the lobster basted with melted butter, dusted slightly with salt and pepper, and, if baked, placed in a very hot oven for half an hour, basting frequently. If broiled, arrange in a broiler, sear quickly the flesh side, and broil, shell side down, at an elevation of six inches over a perfectly clear coal fire for about 30 minutes, or, if underneath a gas stove, with the flesh side up, basting four or five times while broiling. Serve immediately with melted butter sauce.

Scallops Fricasseed or Fried.—Of scallops only the muscular part is used. Fricasseed they form one of the nicest of luncheon dishes. Wash them thoroughly in cold water, drain, and pour over sufficient boiling water to cover; bring them to the boiling point and drain again. To each pint allow two tablespoonfuls of butter, two tablespoonfuls of flour, half a pint of milk and the yolks of four eggs. Put the butter and flour into a saucepan; when mixed add the milk and stir until boiling; add the scallops, a teaspoonful of salt, a dash of pepper, just a grating of nutmeg, and when hot add the yolks slightly beaten, a tablespoonful of chopped parsley, and serve at once. Scallops may also be dipped in egg and breadcrumbs, fried in smoking-hot fat and served with tomato ketchup or sauce.

Poultry and Game Birds.

The term poultry includes chickens, turkeys, ducks, and geese. Its flesh is lighter in color than that of other animals, but it is very nourishing. The flesh of ducks, geese, and many wild birds is much darker than that of the chicken or turkey. The flesh of birds is never mottled, like that of mammals; that is, it does not contain fat in layers between the musuclar tissue, though there may be much fat in other parts of the body. The flavor and digestibility of the flesh of birds differ considerably, and the flavor is much affected by the food. The white meat of birds is generally considered the most tender, and the dark meat the most savory and stimulating.

Roast Turkey.—Be careful to choose a young turkey. Remove the feathers carefully, and singe over a burning newspaper on the top of the stove; then carefully "draw" the fowl, being heedful not to break any of the internal organs. Remove the crop, cut off the head, and tie the neck close to the body by drawing the skin over it. This done, the inside of the turkey must be carefully rinsed out with several waters, a teaspoonful of baking soda being mixed in the next to the last. The inside of a fowl is often sour, if it has not been freshly killed, and soda acts as a corrective to this. Next wipe the turkey dry, inside and out, with a clean cloth, rub the inside with some salt, and fill with the dressing described below. Then sew up the body with a strong thread, tie the legs and wings to the body, rub with a little soft butter, sprinkle with salt and pepper, and dredge with a little flour. Now place the turkey in a dripping pan, pour in a cup of boiling water, and set it in the oven. Baste often, turning the bird around occasionally so that every part will be uniformly done. If the liquid runs out clear when the body is pierced, the bird is done. If any part is likely to scorch, pin over it a piece of buttered white paper. A fifteen-pound turkey requires between three and four hours to bake. Serve with cranberry sauce.

Turkey or Chicken Dressing.—Crumble one loaf of bread fine, soften with melted butter, cover closely, let stand from half to one hour, then add salt, pepper and a little sage and onions, mix thoroughly.

Chestnut Dressing for Turkey.—For a ten-pound turkey, one quart of Spanish or two quarts of common chestnuts will be required. Shell, blanch and boil them until tender; drain, mash or chop fine; add a tablespoonful of butter, a teaspoonful of salt and a saltspoonful of pepper. Mix and stuff into the turkey.

Roast Turkey with Oysters.—Clean a turkey and lay it in a dripping pan; prepare a dressing of stale bread, composed of one quart of bread crumbs and one cupful of butter, and water enough to moisten. Add to this two dozen oysters and pepper and salt to taste. Mix all, and stuff the turkey with it; and put butter over the outside; put some water in the dripping pan, set it in the oven and bake until done, basting quite often. Never parboil a young turkey.

Gravy for Turkey.—When the turkey is put in to roast, place the neck, heart, liver and gizzard in a stew-pan with a pint of water, and boil until they become quite tender. Then, chop the heart and gizzard, mash the liver, and throw away the neck. Return the chopped meat to the liquor in which it was stewed. When the turkey is done this material should be added to the gravy that dripped during the roasting, the fat being first skimmed from the surface of the dripping-pan. Set it then over the fire, boil three minutes and thicken with flour. Brown flour will not be needed to color the gravy. The garnishes for turkey or chicken are fried oysters, thin slices of ham, slices of lemon, fried sausages, or force-meat balls. Parsley is also used.

Fried Chicken or Beef Gravy.—Add one tablespoonful of flour to the fryings after the meat has been taken up; stir rapidly, and do not allow it to scorch; add one pint sweet milk, salt and pepper to taste; let boil until thick.

Roast Chicken.—Pick and draw your chicken, wash in two or three waters, and add a little soda to the last but one if there is any doubtful odor. Fill the bodies and crops with a filling of bread crumbs, butter, pepper, salt, etc., as described for roast turkey; sew them up, and roast an hour or more, according to size, Baste at first with butter and water, and afterwards with the gravy from the pan. A little hot water should be put in the pan to prevent burning.

Stew the neck and giblets in a little water, and, after removing the chickens from the pan, pour this into the drippings; boil up once; add the giblets, chopped fine; thicken with browned flour, and serve in a gravy boat. The chickens may be served with tomato sauce or crab-apple jelly.

Roast Goose.—The goose should be absolutely young; fill with dressing made of two pints bread crumbs, one onion chopped fine, three tablespoonfuls butter, one egg, slice of pork chopped fine; salt and pepper. Put in roaster, and sprinkle with salt, pepper and flour; put one quart of boiling water in roaster and cook from three to four hours. Boil the giblets tender; chop for the gravy; thicken gravy with a little flour and milk. Serve goose with apple sauce.

Fricasseed Chicken.—For this the fowls need not be as tender as for roasting. Clean, wash, and cut up, and place for half an hour in salt water. Then put into a pot, with half a pound of salt pork, and cover with cold water. Cover the pot, let them heat very slowly, and then stew for over an hour, or much longer if the chickens are tough. Take care to cook very slowly; rapid boiling toughens them. When tender add a small onion or two, some parsley and pepper. Cover again, bring to a boil, and stir in a cupful of milk, to which are added two beaten eggs and two tablespoonfuls of flour. Boil up, and add a large spoonful of butter. Place the chicken in a deep dish, pour the gravy over it, and serve. In all cases where beaten egg is added to a hot liquid, it is best first to drop a little into the egg, beating while doing so, to heat it gradually, and prevent it curdling, as it will if thrown suddenly into hot liquor.

Broiled Chicken.—Be sure that your chicken is young. If in doubt as to this, it is best to make it tender by steaming. Place sticks across a dripping pan full of boiling water, lay the chicken upon these, cover with a tin pan, set in the oven, and let it steam for half an hour. (The chicken should first be split down the back and wiped perfectly dry). Then transfer to a buttered gridiron, inside downward, cover, and broil till brown and tender, turning several times. Put into a hot dish, butter well, and serve smoking hot.

Broiled Chicken on Toast.—Broil in the usual way, and when the fowl is thoroughly done take it up in a square pan, butter it well, season with pepper and salt, and set it in the oven for a few minutes. Then put slices of moistened buttered toast on a platter; lay the chicken upon it; add to the pan gravy part of a cupful of cream or milk thickened with a little flour; pour over the chicken, and serve.

Stewed Duck.—Prepare the fowls by cutting them up, in the same way as chicken for fricassee. Lay some very thin slices of salt pork upon the bottom of a stew-pan,

and place the pieces of duck upon the pork. Stew slowly for an hour, closely covered. Then season with salt and pepper, and add half a teaspoonful of powdered sage, or minced green sage, and one chopped onion. Stew another half hour, or until the duck is tender. Stir a large tablespoonful of brown flour in a little water and add it to the stew. Let it boil up, and serve all together in one dish, accompanied by green peas.

Chicken Croquettes.—Take the cold chicken, chop very fine, use about one-third as much cracker crumbs (not too fine) as you have meat. Season with salt and pepper; add one egg beaten, and cold gravy; make into rolls or round cakes, dip into batter, fry in very hot drippings, one-half butter and one-half lard.

Chicken Hash.—Remove the meat from the bones of cold stewed chicken, cut into small pieces, putting these in the gravy. Set on the fire with milk enough to cover; add butter, pepper, and salt; thicken with flour. When done, serve on hot buttered toast.

Chicken Stew.—Cook the fowl in the same manner as for fricassee. When the meat is tender remove it from the water and serve with a sauce prepared with the liquid in which the meat was boiled. To one pint of liquid allow the following ingredients: One tablespoonful butter, two of flour, and one of parsley, if desired; one-half teaspoonful of salt and one-quarter of pepper.

Chicken Pie.—Boil chicken until tender (one year old is best), peel half dozen potatoes while it is stewing. To make the crust, take one quart of flour, one tablespoonful of baking powder, a little salt, half a teacupful of lard, and sufficient water to make a stiff dough; roll half the dough to the thickness of one-half an inch; cut in strips and line the dish. Put in half the chicken and half the potatoes; season with butter, pepper, and salt; dredge well with flour and put in some of the crust cut in small pieces. The other half of the chicken and potatoes put in with butter, salt, and pepper, and dredge with flour as before; roll out the rest of the dough for upper crust. Before putting on the cover fill the dish nearly full of boiling water, put in the oven immediately, and bake one hour.

Smothered Chicken.—Singe a young chicken and split it down the back; take out the intestines; wipe it with a damp towel; lay the chicken with inside downward in the baking pan, breaking the breastbone to make it lie flat; spread the breast with a quarter pound of butter, dredge with pepper, put a teaspoonful of salt and half cup of water in baking pan. Place in a hot oven, let it bake half hour, basting every ten minutes. Now remove the lid, turn the chicken, baste it well on inside, cover and bake another half hour; when done, place on a hot dish, put the pan in which the chicken was cooked on the fire to brown, add one tablespoontul of flour; stir until smooth and brown, add half cup of milk. Stir constantly until it boils; if not properly seasoned add salt and pepper and serve.

Chicken Salad.—Mince the white meat of a cold boiled or roasted chicken, removing all fat, gristle, or skin. Cut celery into bits half an inch long, making three-fourths the bulk of the chicken. Mix and set aside, while preparing the dressing. For this rub to a fine powder the yolks of two hard-boiled eggs, add a teaspoonful each of salt and pepper, and two of white sugar, and then three teaspoonfuls salad oil, a few drops at a time, grinding hard while doing so. Add a teaspoonful of made mustard, and let stand while you whip an egg to a froth. Beat this into the dressing, add a half cup of vinegar, beating it in gradually. Sprinkle a little salt over the meat, toss it lightly with a fork; pour on the dressing, and mix till thoroughly combined. Place in salad bowl, and garnish with egg rings and bleached celery tops. Turkey may be used instead of chicken. Many prefer it.

Roast Game.—To roast a partridge, grouse, or any other gallinaceous bird, is one of the simplest processes of cooking, yet one in which the game is often spoiled by being cooked too fast, the surface becoming scorched before the flesh is fairly warmed through. By this means the flavor is lost, the juices dissipated, and the natural tenderness of the meat destroyed.

A MODEL KITCHEN

The two views show a model kitchen arranged for convenience—for health and economy. The floor covered with oil cloth or tiles, the walls papered or painted, plumbing easily accessible, pantries and cupboards ample—range of the latest pattern, and sinks with hot and cold water.

BEDROOM FURNISHINGS

The room at the left is a suggestion for a room furnished in blue and white. The walls may be hung with satin striped paper. The draperies may be easily made and artistically arranged. The room at the right looks out upon a balcony. The bedstead may be of brass, the furniture of birds-eye maple, bedspread and bureau cover may be trimmed with lace. The floors may be covered with rugs, and walls tinted.

The birds should be kept at such a distance from the fire that the flesh may be fully heated before the surface becomes browned. Then move slowly nearer the fire, so that the heat may fully penetrate the flesh. The birds should be basted occasionally with their own drippings, or with melted butter slightly seasoned. Catch the drippings on pieces of thin, crisp toast laid in the pan, one small slice for each bird. When nearly cooked, dredge the birds lightly with flour and cracker or bread crumbs. This unites with the juices and makes a beautiful brown crust.

The process should, if the fire be brisk, occupy about twenty minutes for a partridge, thirty for a grouse, fifteen for a snipe, plover, or woodcock. Serve each bird on a slice of toast, in covered hot dishes. This is the simplest way of cooking every variety of game birds.

Broiled Game.—Partridges, split in the back, and broiled over a bright fire, with a dressing of salt, pepper and butter, make an excellent dish. Care must be taken not to cook them too fast, or the same difficulty above mentioned, of browning the outside before the flesh is warmed through, will result. The fire should not be too hot, nor the gridiron rest too near it. In all cases game should be served on hot dishes.

Rail and Reed Birds.—Rail, when roasted on the spit, enveloped in greased paper, are very good. They should never be stuffed. Fifteen minutes will cook them if the fire be brisk. Reed birds are best when roasted *au naturel* on the spit before a brisk fire. They cook better enveloped in greased paper, there being less waste of the fat. They are good, also, when stuffed with bread crumbs, butter, and a little of herbs; and also when nicely broiled. Some prefer them this way to all others.

Fried Rabbit.—Freeze or soak in salt water over night; cut off all the fat. Boil tender, changing the water once or twice. Dip in a batter and fry in hot butter and lard mixed.

Stewed Rabbit.—Dress and freeze or lay in salt water over night, boil until tender, season with butter, and make dumplings, same as biscuit dough; roll, cut in pieces and drop them in; thicken gravy with a little flour and milk.

Rabbit Smothered in Onions.—Parboil the rabbit, salt, pepper, and roll in flour. Put in pot alternately a layer of rabbit and a layer of onions. Let simmer slowly until done.

Quail on Toast.—Pick dry, draw and split down the back; wash and soak in salt water a few minutes, drain and dry with a cloth. Broil and baste often with butter; set in the oven with bits of butter on each piece and brown nicely. (They may be fried as chicken if desired.) Have ready as many slices of buttered toast as there are birds and serve with breast upward on each slice.

Roast Pigeon.—When clean and ready for roasting, fill with dressing made same as for turkey or chicken. They must be well basted with melted butter, and roast from three-quarters to one hour.

Game Pie.—When several kinds of small game are brought in, the best way to utilize them is to stew each kind tender, add them together with enough butter to make the gravy rich, and make the pie by lining a baking-pan with a rich crust the same as for chicken pie; put in the game, seasoned with salt and pepper, a little of the dough for dumplings, and the gravy after it has been thickened; add top crust, pinch the edges together like pie; bake half an hour in a hot oven.

Meats.

What we call flesh is chiefly composed of muscle, with a certain proportion of fat and a considerable quantity of water. A piece of fresh beef, thoroughly dried, will lose three-fourths of its weight. Starch and sugar, which compose nearly fifty per cent. of wheat bread, are absent from meat. For this reason a due admixture of animal and vegetable food seems best adapted for the nutrition of the human body.

Wild animals have usually very little fat. Domestic animals, fed for the market, have often a large proportion of it. The flesh of heavy sheep may be three-fourths

fat. Such fattening as this is unprofitable to the consumer, causing much waste. Good meat may be told from its firmness and elasticity to the touch, from its marbled appearance, its color, between pale pink and deep purple, its lack of unpleasant odor, and its slight shrinkage in cooking.

The following directions for the choice of meat will be of service to the young housekeeper:

To Choose Beef.—In ox-beef the grains should be loose, the flesh red, and the fat of a fine cream-color. Cow-beef has a closer grain, a whiter fat, and meat not quite so red. Poor beef is indicated by a hard, skinny fat, a dark-red lean. In old animals a line of horny texture runs through the meat of the ribs. When pressed by the finger the meat should rise up quickly, if it does so slowly, age is indicated.

Mutton.—The meat of sheep should have a firm, close grain and dark-red color, the fat being white and firm. If too young, the flesh is tender when pinched; if too old, it wrinkles and remains so.

Lamb.—This meat will not keep long after it is killed. If fresh the large vein in the fore-quarter should be bluish in color; if stale this becomes green. The flesh should be light-colored and juicy, the fat white and rich.

Veal.—Good veal is white, smooth and juicy; the fat white and firm. The flesh of a bull-calf is firmer and darker than that of a cow-calf. If stale, the color changes quickly, the flesh feels moist and clammy, the joints flabby, and there is a faint musty odor.

Pork.—Here we should have a thin, smooth rind, cold to the touch, the fat must be very firm and the lean white. The rind of young pork should yield easily to the finger. The flesh should be smooth and dry; if clammy, it is tainted. "Measly pork" is very unwholesome, and may be told by the fat being full of enlarged glands, or kernels.

Bacon.—This should have a thin rind, and firm and reddish fat; the flesh a tender, clear red, with no yellowish mixture, and clinging closely to the bone.

Ham.—To judge this, put a knife under the bone and up to the knuckle. If particles of meat adhere to the knife or the odor is unpleasant, the ham is not good.

Poultry.—In selecting poultry choose those that are full-grown, but not old. When young and fresh-killed, the eyes are full and bright, the joints neither stiff nor flabby; the skin is thin and tender, so that it may be easily torn with a pin; the breast-bone is pliable, yielding easily to pressure. Fowls, if young, have a hard, close vent, and the legs and comb are smooth. Old turkeys have rough and reddish legs; young ones smooth and black. If fresh killed the eyes are full and clear and the feet moist. A goose, if young, has but few hairs, a yellow bill, and is limber-footed. Ducks, when fat, are hard and thick on the belly; if young and good, they are limber-footed.

Eggs.—Put your tongue to the larger end; if it feel warm, the egg is fresh. Or put the egg into a pan of cold water; if perfectly fresh, it will sink immediately, and so in proportion to its freshness; a rotten egg will float on the top of the water.

Of ordinary meats mutton is at once the most nutritious and the easiest of digestion. Beef is usually considered more strengthening, but demands more vigorous digestive powers. Veal and lamb, though tender, are less digestible than the flesh of mature animals, this being especially the case with veal. Of all meats, however, pork stands first in the rank of the indigestible.

When meat comes from the market it should be wiped at once with a fresh, damp cloth, covered, and put in a cool place. Never wash fresh meat, as cold water draws out the juice. Remove from mutton all the pink skin attached to the meat; if left it will give it an unpleasant taste when cooked. The organs of animals, as the heart and kidneys, should be washed thoroughly; salted meats need washing to remove the salt.

Modes of Cooking Meats.

Meat may be boiled, roasted, stewed, fried, or prepared in other ways. Tender cuts should be cooked in their own juices to preserve the flavor. The meat should at

first be subjected to a high temperature to harden the albumen on the outside and thus prevent the escape of the internal juices. Then the temperature should be lowered to 180 degrees.

Roasting.—In roasting the object is to retain all the juice in the meat. The heat should be sharp at first, for the reason above stated, and then reduced so that the albumen in the interior may be gradually coagulated without shriveling and hardening the fibre. The flesh of young animals is better adapted for roasting than boiling, as it contains more of those principles soluble in water and which may be boiled away. Whenever it is desired to retain and increase the flavor, roasting is the better method. This applies to pork, venison, and game, and to poultry unless it be lean and old.

Boiling.—Meat properly boiled retains more of its nutritious properties and is more easily digested than if cooked in any other way. It loses less in weight than by either roasting or baking. The degree of extraction of juices depends on the degree of heat and the way it is applied. If broth is desired the meat should be soaked in cold water, and the heat applied gradually and kept below the boiling point. To obtain stock for soup, it must come to a boil and this be kept up for some time. But if boiled meat is the object, the joint should be plunged at once in boiling water, so as to coagulate the outer albumen, and the boiling kept up for five or six minutes. Then the temperature should be brought down to 160° F., and the process continued till the interior is fully cooked.

Baking.—In baking the temperature is more equally maintained, and there is less loss of the sapid contents of the meat than in roasting. The joint is richer in flavor and its juices more fully retained. But it is less suitable for delicate stomachs. Great care must be taken that the fat does not come into contact with the hot iron of the stove, as, if burnt, it gives unpleasant and noxious qualities.

Stewing.—This method is intermediate between boiling and roasting, and is much the best method of rendering the meat tender, juicy, and sapid. Meat that would otherwise be quite indigestible may be thus utilized. It also admits of combining a number of articles, both animal and vegetable, and is often the best way to employ canned meats. **Hashing** is the same process applied to meat which has been previously cooked. It often fails for this reason, the meat being made tough and leathery. Very little water is needed for stewing, often the juices proving sufficient, if care be taken to prevent burning.

Broiling.—Broiling has much the same effect as roasting. The purpose is to keep the juice in the meat, which is held over a clear fire for a few seconds, until the albumen on one side hardens. As soon as the juice begins to rise the meat is turned and the albumen on the other side hardened. Continue to turn the meat frequently until it is cooked. Frying, a very common method, produces indigestible meat, the fat, upon which the gastric juices do not act, being thoroughly absorbed, and seriously interfering with digestion.

Beef.

Roast Beef.—The sirloin and rib pieces of the beef are the best for roasting—the latter for small families. Have the butcher remove the bone and skewer the meat into a round shape. It is better, in oven roasting, to dash a small cup of boiling water over the meat when first put in. This acts to check the escape of the juices until the meat is warmed through. If very fat on top, cover with a paste of flour and water till nearly done. Baste frequently, with water at first, then with the drippings. A quarter of an hour to the pound will cook it rare; if it is to be well done, cook longer. Remove, when done, to a heated dish, and make gravy from the drippings, or serve the liquor which runs from the meat when cut. Serve with mustard, or vinegar and scraped horseradish.

Yorkshire Pudding.—This is an excellent addition to a roast of beef. To make it, take one pint of milk, four eggs—white and yolks beaten separately—one teaspoonful of salt, and two teaspoonfuls of baking powder sifted through two cups of flour.

These should be mixed very smooth, and made about the consistency of cream. On taking the roast from the oven, set it where it will keep hot. In the meantime have the pudding prepared. Take two common biscuit tins and dip into them some of the drippings from the dripping-pan; pour half of the pudding into each, set them into the hot oven, and keep them there until the dinner is dished up. Take the puddings out at the last moment and send to the table hot. This is much better than the old way of baking the pudding under the meat.

Broiled Beefsteak.—Place the steak in a wire broiler; hold it over the fire, near the coals; count ten slowly, then turn it; continue to count ten and turn till the meat is done. From five to seven minutes will cook a steak an inch thick; eight to ten minutes if an inch and a half. Season with salt on both sides, but do not put butter on the steak. Serve at once on a hot platter.

Pan-Broiled Steak or Chops.—Buy tender meat. Trim off all the fat possible. Heat a frying-pan very hot, so that it hisses if a little water is dropped in. Lay in the meat, count ten, and turn; count and turn again, and so on until the meat is cooked. A steak or chops one inch thick will require from five to seven minutes. Season and serve in the same manner as broiled meats.

Beefsteak Smothered in Onions.—Season the steak with salt and pepper, dredge with flour, and brown in hot fat. When done on one side, turn and put in the sliced onions, cover, and when the onions are done cover with water. Cook slowly four or five minutes. Or fry the onions separately, and, when done, dish the steak and lay them thickly over the top.

Rolled Steak.—Take a round steak, pound, pepper and salt. Take bread crumbs and make a dressing of them and spread over the top of the steak. Roll and tie it with a string. Put in pan and roast forty minutes.

Beef Stew.—Put on to boil in three quarts of water three pounds of beef without bone. Let boil until tender, and add potatoes; season with salt and pepper. When well done, make a gravy of flour and water, and serve hot.

English Stew.—Cut meat in slices, sprinkle with salt, pepper, and flour. Lay in a dish, and put a few pickles or a small quantity of pickled cabbage over the meat. Take half a teacup of water, add a little vinegar, pour over the meat, bake half an hour. Serve immediately.

Pot Roast.—For this purpose take a tough piece of meat. Cut off some of the fat and melt it in a deep frying-pan or iron kettle. When the fat is hot, put in the meat and brown it on both sides to harden the albumen and keep in the juice. Add one pint boiling water, cover, and simmer slowly until tender; then add one teaspoonful salt. If the water evaporates, do not add any more, as the fat will finish cooking the meat.

Boiled Beef to Serve Cold.—Take a boiling piece of beef, roll and tie, put in kettle with boiling water, salt and pepper. Chop fine one small onion, break in pieces two bay leaves, boil all together; add boiling water as needed. Boil down very low. Let cool in the liquor. Slice cold.

Hamburg Steak.—Chop finely one pound of lean, raw beef, season with salt and pepper, add a few drops of onion juice, one egg, mix all together and make into small balls or cakes. Broil over hot coals, or cook in a small quantity of smoking hot fat. The steaks are much better if allowed to stand several hours before cooking, so that the flavors may blend before the cakes are made up. They may be served with tomato sauce.

Meat Croquettes.—One cup of cold chopped beef, one cup bread crumbs, one egg. Pour over this enough of the hot liquor to make quite soft. Add salt and pepper, make in small rolls, dip in beaten egg, then in cracker crumbs. Fry in hot lard.

Spiced Beef.—Four pounds of round beef chopped fine, trim off the fat, add three dozen crackers, rolled fine, four eggs, one cup milk, one tablespoonful ground mace, two tablespoonfuls pepper, one tablespoonful butter; mix and put in pan, and baste

with water and butter; bake two hours in a slow oven.

Curing Fresh Beef.—To each one hundred pounds of beef take four gallons of water, put in kettle, also six pounds common salt, two ounces saltpetre; simmer over slow fire, and skim. When cold pour over beef, which should be loosely packed. Hang in about three weeks, or put in new brine, or boil and skim the old.

Beef Tongue.—Wash the tongue and soak over night in cold water. Put it into a pot of cold water, and boil slowly until it is tender to the centre. When cold, take it from water, pare off the skin, cut in round slices, and garnish with parsley. Tongue is considered better than ham for sandwiches.

Pickled Beef Tongue.—Wash tongue thoroughly, soak over night in salt water; put in cold water and cook until tender, remove the skin while warm; put in stone jar, cover with hot vinegar to which is added one teaspoonful of mixed spices. This will keep for some time.

Dried Beef.—This is commonly served raw, shaved into thin slices; but is more savory if cooked. Put the slices into a frying-pan, cover with boiling water; cook for ten minutes, then drain and cut into small bits. Return to pan with a little butter, and stir into the pan four well-beaten eggs for a half pound meat; stir and toss the mixture for about two minutes. Serve in a covered dish.

Boiled Corned Beef.—Skewer your piece into shape, wash it in three or four waters, and tie it up with stout twine. Cover it in a pot with cold water. In boiling, give about twenty minutes to a pound, turning it three times while cooking. When done, drain dry and serve with drawn butter in a sauce boat. Boiled turnips are eaten with the meat.

Roast Veal.—Cook veal longer than lamb or mutton, allowing at least a quarter hour to each pound. Heat gradually and baste frequently. When nearly done, dredge lightly with flour and baste once with melted butter. If browning too fast, cover with white paper. Breast and fillet of veal need to be filled with a dressing made of bread crumbs, chopped thyme or parsley, seasoning, and a beaten egg.

Veal Cutlets.—Sprinkle the cutlets with salt and pepper, dip in beaten egg, roll in cracker crumbs, and fry in hot lard or dripping. A little boiling water may be added to the gravy when the meat is dished, and a thickening of brown flour.

Veal Stew.—Two pounds of veal, one tablespoonful of lard, one tablespoonful of butter; slice one medium sized onion over the meat, add one half teacup of vinegar, as the meat stews add a little water. Cook two hours.

Veal Fricassee.—Take two lbs. of shank or neck of veal, remove bones, place them in a saucepan, season, add two cups cold water, and cook slowly. While cooking slice two onions, cut the meat into inch cubes, remove the fat, and dredge the meat with flour. Fry the onions brown and add to the water. Brown the meat slightly and add. Let simmer half an hour. Cook together one tablespoonful each of flour and butter, add gradually half cup of milk, and stir it into the fricassee. Boil five minutes and serve.

Calf's Head.—After washing, take out the brains and put in a cool place. Tie the head in a floured cloth and boil for two hours, adding some salt to the water. Wash and carefully pick the brains, cleansing them till quite white; cover with water and stew; mash smooth, and add gradually a cupful of the water in which the meat is boiled. Season with butter, parsley, sage, pepper and salt. Drain the head very dry, score the top and rub it over with melted butter; dredge with flour and set in the oven to brown. When served, pour the gravy over it. Do not skin the head. Mock-turtle soup is made of calf's head, chopped fine, well seasoned and boiled, the brains being used with the yolks of eggs to make force-meat balls.

Fried Sweetbreads.—To fry sweetbreads, wash carefully and rub dry, lard with narrow strips of fat pork, and lay in a hot frying-pan, well greased, and cook to a

fine brown. Turn frequently, till the pork is crisp.

Broiled Sweetbreads.—Rub well with butter, and cook on a clean gridiron. Turn frequently, occasionally rolling on a plate with some hot melted butter. This keeps them from getting dry and hard.

Stewed Sweetbreads.—Remove all skin and fat, cover with cold water, and bring to a boil. Pour off the hot water, and cover with cold until they are firm. Stew a second time in very little water. When tender, add a teaspoonful of butter for each sweetbread, with pepper, salt, chopped parsley and a little cream. Simmer for five minutes, and serve in covered dish, with the gravy poured in.

Sweetbreads with Tomatoes.—Soak in salt water for one hour; take out, pepper and dip in bread crumbs and fry in hot fat, when done put in a dish and pour tomatoes over sweetbreads. Prepare tomatoes by straining through a sieve and season with salt, pepper and butter, thicken with flour, cook until thick.

Mutton.

Roast Leg of Mutton.—Remove the bone from a leg of mutton and mix a filling as follows: one cup rolled cracker or bread crumbs, and one teaspoonful each of salt and sage, with sprinkle of pepper. Mix these, scald a little dropped onion—if liked—and add; moisten with milk or water. Sprinkle the cavity with salt, fill it and sew. Dredge with salt, pepper and flour. Place the meat on a rack in a roasting-pan, and bake in a hot oven, allowing twenty minutes to a pound. Baste once in fifteen minutes. When done, remove the strings and put the meat on a hot platter. Pour off the fat from the pan, stir half tablespoonful flour into the browned sediment, add one cup boiling water and boil five minutes. Strain and serve as a gravy.

Chickens and other poultry may be filled and roasted as directed. Beef is usually roasted without filling, and mutton frequently.

Leg of Mutton a la Venison.—After removing the rough fat from the mutton, lay it in a deep earthen dish, and rub on thoroughly the following compound: One tablespoonful of salt, one each of celery-salt, brown sugar, black pepper, English mustard, allspice, and some sweet herbs, all powdered and mixed. Then pour over the meat a teacupful of good vinegar, cover tightly, and set in a cool place four or five days, turning it and basting often with the liquid each day. To cook, put in a kettle a quart of boiling water, place over it an inverted shallow pan, and on this lay the meat just as removed from the pickle; cover the kettle tightly and stew four hours. Do not let the water touch the meat. Add a cup of hot water to the pickle remaining and use it to baste with. Make a gravy by thickening the liquid with flour and straining through a fine sieve. Serve with currant jelly, as for venison.

Stuffed Shoulder of Mutton.—Have the butcher remove the blade from a shoulder of mutton. Fill the cavity thus formed with a stuffing of well-seasoned bread crumbs and a half pint of oysters. Sew up and press into shape. Baste frequently while roasting. When done remove all fat from the drippings in the pan and thicken slightly. Parboil another half pint of oysters and add to the gravy.

Mutton Chops.—Trim off the superfluous fat and skin from your chops, if not done by the butcher; dip each chop in beaten egg, roll in cracker dust, and fry in hot lard or dripping. Omit the egg if desired. Sprinkle the chops with salt before rolling in the egg, or salt the fat. Serve dry and hot.

Broiled Mutton Chops.—Mutton chops should be cut one inch thick. Trim off the skin and the greater part of the fat. Lay the meat in a wire broiler and proceed as in broiling steak. It requires from four to six minutes to cook a chop one inch thick. Season chops with salt and pepper, but no butter, and serve immediately on a hot platter.

Lamb Chops are very delicate and tender. Prepare and broil them in the same way that mutton chops are broiled. They require longer cooking than mutton chops and should never be served rare. A lamb chop

one inch thick should be cooked from seven to ten minutes.

Lamb Stew.—Cut the lamb into small squares, first removing the fat. Then put on in stew-pan, covering with water, and let heat slowly. When partly done add a little sliced salt pork, one or two sliced onions, pepper and salt, and two or three cut-up potatoes. Cover, and continue to stew till the meat is tender. Then drop in a few small dumplings, stew fifteen minutes more, and serve. The gravy should be thickened with a little flour moistened with milk.

Spring Lamb.—Bake six pounds of meat one hour and a half in a moderate oven. Season when put to roast. Baste often. Serve with mint sauce.

Mint sauce: Take a handful of fresh mint, wash and dry. Take leaves and chop fine, add a tablespoonful of sugar, one of water and cover tightly for one hour and a half. An hour before serving add three-fourths cup of vinegar and serve with lamb; add essence of mint if desired.

Pork.

Roast Pork.—Prepare pork by washing. Score the skin in lines, forming little squares. Have a moderately hot oven; baste with its own drippings; season with salt and pepper. The time required depends on size of roast.

Roast Spare Rib.—Cover the meat with a greased paper until half roasted; then remove the paper and dredge with flour. In a few minutes baste with its own gravy. Before taking up strew the surface with bread crumbs seasoned with powdered sage, fine chopped onion, pepper and salt. Cook five minutes and baste again with butter. Skim the gravy, pour in half a cup of boiling water, thicken with flour, season, and pour over the meat.

Spare Rib with Oysters.—Wash ribs, wipe dry, salt and pepper. Take one quart of oysters, one dozen crackers, mash fine, salt and pepper and roll up in spare ribs and pin with wooden tooth pick.

Roast Pig.—Take a pig about six weeks old, wash it thoroughly, and rinse out the inside again with water containing a little baking soda. Wipe with a fresh towel, salt the inside, and stuff with the prepared dressing; making the pig plump, so as to give it its original size and shape. Sew it up, place it in a kneeling posture in the dripping-pan, and tie the legs in proper position. Pour into the pan a little hot salted water, and baste with butter and water a few times as the pig warms; afterwards baste with gravy from the pan. When the meat begins to smoke rub it often with a rag dipped in melted butter. This will keep the skin from cracking while still keeping it crisp. Roast for two or three hours. To make the gravy, skim off most of the grease, stir into that remaining in the pan a good tablespoonful of flour, with water enough to make it the right consistency, season with pepper and let it boil up once. Strain, and add half a glass of wine, if preferred. Turn into a gravy boat. Place the pig upon a large, hot platter, surrounded with parsley or celery tops; place a green wreath around the neck, and a sprig of celery in its mouth. In carving, cut off the head first, then split down the back, take off the hams and shoulders, and separate the ribs.

Pork Steaks.—Remove the skin and trim neatly. Broil over a brisk fire. Season after taking up with pepper, salt, a little sage and minced onion. Cover and set in the oven for five minutes. Spare ribs can be cooked in the same manner.

Salt Pork Fried in Batter.—Prepare as for plain fried pork, fry without putting in flour. When ready to remove from dripping pan dip in a batter made as follows: One egg, two tablespoonfuls milk, two of flour, add a little salt, and dip the fried pork into the batter. Put quickly back into the hot drippings, fry a light brown, and serve as soon as possible.

Pork Chops.—Season pork with salt and pepper, beat up an egg, dip the pork in the egg, then in cracker crumbs or corn meal, fry in plenty of lard, boiling hot.

Boiled Ham.—Soak over night, and wash hard next morning with a stiff brush or coarse cloth. Put on to boil with plenty

of water. Do not boil too fast, and allow fifteen minutes to each pound. Do not remove skin until cold. Prepare for table by garnishing with dots of pepper or dry mustard, and with parsley around the sides.

Broiled Ham.—Cut in slices, soak well in scalding water, wipe dry, and lay in cold water for five minutes. Wipe again, and broil over a clear fire. Pepper before serving. To fry ham, prepare as for broiling, and cook in a hot frying-pan, turning often. Serve with or without the gravy.

Baked Ham.—Boil a ten pound ham in water enough to cover, to this add two pounds of brown sugar. Boil three hours, then skim. Mix a tablespoonful of dry mustard and one of sugar, sprinkle over the fat side, and bake from three quarters to one hour.

Devilled Ham.—Take cold roast ham; chop fine; make a dressing of pepper, mustard, and vinegar; mix thoroughly with the ham. This is very suitable for sandwiches.

Broiled Ham and Bacon.—Cut ham into half-inch slices, or thinner. Trim off the outside skin. Broil in a hot dry pan or over the coals, until it is a delicate brown in color, turning it frequently. When done serve on a hot platter.

To cook bacon, cut it into very thin slices and broil it a few minutes in a hot pan or over a clear fire, turning it very often. It should be of a delicate golden-brown color when done. Serve on a hot platter.

Pork Pie.—One pound of pork chopped in small pieces, four good sized potatoes chopped in squares, cover over with water and cook until tender. Cook meat awhile before putting potatoes in. Make a gravy and pour over; save out some of the gravy to pour over when baked. Make a short dough same as for pies, with a little baking powder in it. Line a small bread pan with crust, put in meat and gravy, cover with upper crust and bake until brown.

Ham Pie.—Make a crust, the same as for biscuit, line pan with dough; then put in a layer of potatoes sliced thin, pepper and salt, and a little butter, then a layer of lean ham, add water and cook slowly.

Pigfoot Sauce.—Cut off the toes, scrape clean and wash thoroughly, and singe. Put in water, boil and skim. Pour off the water and add fresh, then salt, and some lean pieces cut from the head, or other part of the hog. Boil until ready to fall to pieces; dip out and pick all the bones out. Season with salt and pepper. Mix the lean meat with the fat, but do not chop. Press in a crock and set away to cool. Slice thin and pour vinegar over it a few minutes before serving.

Head Cheese.—Boil the forehead, ears, and feet, and trimmings from the hams of a fresh pig. Continue until the meat is ready to drop from the bones. Then separate the meat from the bones, put it in a large chopping-bowl, and season with pepper, salt, sage, and summer savory. Chop it rather coarsely; put it back in the boiling kettle, with enough of the liquor it was boiled in to prevent its burning, and warm it thoroughly, mixing the ingredients well. Then pour into a strong muslin bag, press the bag between two flat surfaces under a heavy weight. When cold and solid it can be cut and served in slices.

Boston Pork and Beans.—Carefully pick a quart of small, white beans, and let them soak over night in cold water. In the morning wash and drain in fresh water. Set on to boil in plenty of cold water, in which is a piece of soda the size of a bean. After they come to a boil drain again, cover again with water, and boil for fifteen minutes, or until the skin of the beans will crack when taken out and blown upon. Next drain the beans, put into an earthen pot, with a tablespoonful of salt, and cover with hot water. Place in the centre of the pot a pound of salt pork, first scalding it with hot water, and scoring the rind across the top a quarter of an inch apart. Place in the oven, and bake six hours or longer, keeping the oven at a moderate heat. Add hot water from the teakettle as needed, so as to keep the beans moist. When the meat becomes crisp and looks cooked remove it, as too long baking destroys the solidity of the pork.

Venison.

Venison Cutlets.—Trim your cutlets nicely, using the trimmings to make gravy, in the proportion of half a pound to a cup of

STEAMED PLUM PUDDING.

Mix thoroughly together half-a-pound of fine chopped suet, half-a-pound of bread crumbs, two ounces (half a cup) of flour, a teaspoonful of cinnamon and one-fourth a teaspoonful, each, of mace and clove, three-fourths a cup of sugar, three-fourths a pound of mixed fruit,—seeded raisins, orange peel, citron of figs, and a teaspoonful of salt; beat four eggs, add two or three tablespoonfuls of milk and stir into the dry ingredients. If the mixture is not moist enough, add more milk. The mixture should be much too soft to handle, but of such consistence that it can be taken up in heaped spoonfuls. Steam in a buttered mold about five hours. As the water evaporates, replenish with boiling water. Serve hot with a hard or a liquid pudding sauce.

BLACKBERRY SHORTCAKE.

Sift together three cups of pastry flour, one teaspoonful of salt, and six level teaspoonfuls of baking-powder; with the tips of the fingers, well floured, work in one-third a cup of butter and mix with about one cup and-a-half of milk and water to a soft dough; spread in two buttered pans, smoothing the dough with a knife or spoon. When baked, butter the under crust, and put together with two baskets of blackberries that have been standing mixed with granulated sugar for some time. Sprinkle the berries on top of the cake with powdered sugar. The berries between the cakes and a part of those on top may be mashed if desired.

water. Put in bones, fat, etc., and let stew in a saucepan while you prepare the cutlets. When the gravy has stewed an hour, strain and let it cool.

Lay the cutlets in a saucepan, with a little onion to each. Also a little minced thyme and parsley, pepper, and very little nutmeg. When all ready, pour in your warm gravy. Stew twenty minutes. Then lay the cutlets in a frying pan, and fry quickly for five minutes, turning frequently. Lay in a chafing-dish, pour in the gravy, having added to it a little sauce, currant jelly, half a glass of wine, and flour thickening. Let all stand in hot place five minutes before serving.

Roast Venison.—Wash and dry with a cloth. Butter a sheet of white paper and put over the fat. Put in roasting pan with a little boiling water. Cover closely; cook in a moderately hot oven for two or three hours. Baste occasionally. Twenty minutes before it is done quicken the fire, remove lid and paper, dredge with flour, butter, salt and pepper. Return to oven and brown. Make a gravy from its own drippings, having first removed the fat. Have meat platter very hot for venison and serve with currant jelly.

Hashes and Sandwiches.

Potato and Meat Pie.—Chop cold meat fine, removing the bones, fat and gristle. Put the meat into a pudding-dish, measuring it to find the quantity. To each cup of meat pour one-third cup of gravy or stock, or one-quarter cup water. Taste the gravy, stir in one-quarter tablespoonful salt, a sprinkle of pepper, and a few drops of onion juice or a little chopped parsley. Boil and mash potatoes, and spread the mashed potatoes as a crust over the meat and gravy. Smooth the crust, and bake the pie on the grate of the oven until golden-brown. It will require from fifteen to thirty minutes.

Hash.—Chop the meat as in the preceding recipe. To each cup of meat add two cups mashed potatoes, one-half tablespoonful salt and a sprinkle of pepper. Mash together thoroughly. Put one-half tablespoonful drippings into a fry-pan. When the fat smokes scrape in the hash, and let it cook slowly until browned on the bottom. Fold over in the middle, and serve on a hot platter. Stewed tomatoes or onion juice or boiled onions chopped, if added to the hash, will improve it.

Vegetable Hash.—To the ingredients of the above recipe add chopped beets, turnips, beans, or a little cabbage. One or all of these vegetables may be used. Moisten the mixture with milk, put it in a saucepan, and stir it twenty minutes over the fire, until the milk is absorbed and the hash is thoroughly cooked. The hash may be put in a covered kettle and set in a moderate oven for two or three hours. The long, slow cooking causes the flavors of the vegetables to blend, and gives it a rich taste.

Baked Hash.—Chop meat fine, put a layer of meat in the baking pan, then a layer of potatoes, mashed or cut in cubes, then a layer of bread crumbs. Season with butter, salt and pepper, enough water to moisten. Bake three-fourths of an hour.

Ham Sandwiches.—Four pounds of ham chopped fine. Dressing: Yolks of four eggs, four tablespoonfuls of vinegar, one small teaspoonful of mustard, one-half teaspoonful of black pepper, juice of one lemon, a little cayenne pepper if desired. Cook until thick; mix with ham and spread between slices of buttered bread.

Dried Beef Sandwiches.—Chop dried beef fine, removing all stringy pieces. Spread between thin slices of buttered bread. These are much easier to digest than ham sandwiches.

Tongue Sandwiches.—Wash the tongue and soak over night in salt water, put on in cold water, boil until tender, take out, remove skin while warm, when cold chop fine. Make a dressing as follows: Yolks of four eggs, four tablespoonfuls vinegar, one small teaspoonful of mustard, one-half teaspoonful pepper, juice of one lemon; cook until thick and mix with chopped tongue, and spread between slices of buttered bread.

Salmon Sandwiches.—One can of salmon chopped fine, one cup bread crumbs, one egg, one tablespoonful of melted butter; season with salt and pepper; mix well, and put in two greased one-pound baking

water. Put in bones, fat, etc., and let stew in a saucepan while you prepare the cutlets. When the gravy has stewed an hour, strain and let it cool.

Lay the cutlets in a saucepan, with a little onion to each. Also a little minced thyme and parsley, pepper, and very little nutmeg. When all ready, pour in your warm gravy. Stew twenty minutes. Then lay the cutlets in a frying pan, and fry quickly for five minutes, turning frequently. Lay in a chafing-dish, pour in the gravy, having added to it a little sauce, currant jelly, half a glass of wine, and flour thickening. Let all stand in hot place five minutes before serving.

Roast Venison.—Wash and dry with a cloth. Butter a sheet of white paper and put over the fat. Put in roasting pan with a little boiling water. Cover closely; cook in a moderately hot oven for two or three hours. Baste occasionally. Twenty minutes before it is done quicken the fire, remove lid and paper, dredge with flour, butter, salt and pepper. Return to oven and brown. Make a gravy from its own drippings, having first removed the fat. Have meat platter very hot for venison and serve with currant jelly.

Hashes and Sandwiches.

Potato and Meat Pie.—Chop cold meat fine, removing the bones, fat and gristle. Put the meat into a pudding-dish, measuring it to find the quantity. To each cup of meat pour one-third cup of gravy or stock, or one-quarter cup water. Taste the gravy, stir in one-quarter tablespoonful salt, a sprinkle of pepper, and a few drops of onion juice or a little chopped parsley. Boil and mash potatoes, and spread the mashed potatoes as a crust over the meat and gravy. Smooth the crust, and bake the pie on the grate of the oven until golden-brown. It will require from fifteen to thirty minutes.

Hash.—Chop the meat as in the preceding recipe. To each cup of meat add two cups mashed potatoes, one-half tablespoonful salt and a sprinkle of pepper. Mash together thoroughly. Put one-half tablespoonful drippings into a fry-pan. When the fat smokes scrape in the hash, and let it cook slowly until browned on the bottom. Fold over in the middle, and serve on a hot platter. Stewed tomatoes or onion juice or boiled onions chopped, if added to the hash, will improve it.

Vegetable Hash.—To the ingredients of the above recipe add chopped beets, turnips, beans, or a little cabbage. One or all of these vegetables may be used. Moisten the mixture with milk, put it in a saucepan, and stir it twenty minutes over the fire, until the milk is absorbed and the hash is thoroughly cooked. The hash may be put in a covered kettle and set in a moderate oven for two or three hours. The long, slow cooking causes the flavors of the vegetables to blend, and gives it a rich taste.

Baked Hash.—Chop meat fine, put a layer of meat in the baking pan, then a layer of potatoes, mashed or cut in cubes, then a layer of bread crumbs. Season with butter, salt and pepper, enough water to moisten. Bake three-fourths of an hour.

Ham Sandwiches.—Four pounds of ham chopped fine. Dressing: Yolks of four eggs, four tablespoonfuls of vinegar, one small teaspoonful of mustard, one-half teaspoonful of black pepper, juice of one lemon, a little cayenne pepper if desired. Cook until thick; mix with ham and spread between slices of buttered bread.

Dried Beef Sandwiches.—Chop dried beef fine, removing all stringy pieces. Spread between thin slices of buttered bread. These are much easier to digest than ham sandwiches.

Tongue Sandwiches.—Wash the tongue and soak over night in salt water, put on in cold water, boil until tender, take out, remove skin while warm, when cold chop fine. Make a dressing as follows: Yolks of four eggs, four tablespoonfuls vinegar, one small teaspoonful of mustard, one-half teaspoonful pepper, juice of one lemon; cook until thick and mix with chopped tongue, and spread between slices of buttered bread.

Salmon Sandwiches.—One can of salmon chopped fine, one cup bread crumbs, one egg, one tablespoonful of melted butter; season with salt and pepper; mix well, and put in two greased one-pound baking

powder cans, with lids on; boil one and a half hours, then take out of cans and brown in the oven. When cold, slice thin and place between slices of bread.

Oyster Sandwiches.—Take a pint of raw oysters and chop them very fine. Add salt and pepper. Put them in the chafing dish with a teaspoonful of butter and three tablespoonfuls of dry biscuit crumbs; after cooking for five minutes they are ready to make up into sandwiches.

Cucumber Sandwiches.—Slice cucumbers thin and place in salt water on ice until ready to use. Butter sparingly thin slices of wheat bread; roll the cucumbers in Mayonnaise dressing and place between two slices of bread.

Lettuce Sandwiches.—Slice thin nice homemade bread, at least one day old, spread thin with good butter; cut in desired shape, dip lettuce leaf in Mayonnaise dressing and lay between.

Eggs

Eggs form a valuable food and should be used as a substitute for meats and in combination with starchy foods. Fresh eggs should always be used, if obtainable.

If eggs are placed in boiling water and allowed to boil, the white becomes tough and indigestible and the yoke undercooked; therefore they should be cooked at a temperature below boiling point.

Boiled Eggs (A).—Have a saucepan of boiling water. Remove to the back of the stove where the water will not boil and add the eggs, being careful that there is sufficient water to cover them. Let them stand from seven to ten minutes if required soft—forty to forty-five minutes if wanted hard.

Boiled Eggs (B).—Cover the eggs with cold water and place over fire. When the water begins to boil they will be cooked properly for soft boiled eggs. If allowed to remain four or five minutes they will be *hard boiled*.

Mustard Eggs.—Remove shells from one dozen hard boiled eggs, cut in halves, take out yolks, add to them salt, ground mustard and pepper, mix all together, add vinegar to moisten; then fill whites with the yellow mixture and serve.

Poached Eggs.—Break eggs, one at a time, into a cup. Put a quart of boiling water and half teaspoonful salt into a saucepan. Let it boil, then move it back on the stove so that it will just cease to bubble. Place muffin rings in the pan. Drop the eggs into the rings one at a time, and cook until the white is firm. Serve them on toast, with a sprinkle of salt on each egg.

Fried Eggs.—Break the shells and drop the eggs one by one in hot fat; dip the fat over them until the white is set; dust with pepper and salt and serve hot; cook from three to five minutes, according to taste. These are less digestible than poached eggs, the hot fat making the albumen leathery.

Scrambled Eggs.—Beat six eggs very light; add a little salt, eight tablespoonfuls of milk, and a small lump of butter. Put in a hot skillet and stir constantly until the eggs harden.

Pickled Eggs. — One pint of strong vinegar, one half pint cold water, a teaspoonful each of cinnamon, allspice and mace; boil eggs till very hard, remove shell; put on the spices tied in a white muslin bag in cold water, boil and, if water wastes away, add enough so as to have half a pint when done, add vinegar and pour over the eggs, put in as many eggs as the mixture will cover.

Sauce for Eggs.—Boil six eggs hard and make a sauce of one lump of butter, one tablespoonful of flour and one pint of milk, mix the butter, milk and flour together and boil. Slice the eggs and pour the sauce over them,

Plain Omelet.—Beat two eggs, add two tablespoonfuls milk or water, and one quarter teaspoonful salt. Heat the pan, put in one teaspoonful butter, and when it melts pour in the mixture. Cook the omelet slowly. As it hardens beneath, raise it with a broad knife and let the liquid portion run under; do this at different sides of the pan. When dry, roll the omelet away from the handle of the pan. Serve on a hot platter.

Foamy Omelet.—Separate the eggs. Beat the yolks and add salt and one table-

spoonful milk for each yolk. Beat the whites until stiff and fold lightly into the liquid. Melt some butter in a frying-pan, when hot pour in the mixture and brown. Then place the omelet in the oven to dry the top. Fold and serve immediately.

Foamy Omelet with Jelly.—Separate the eggs; beat the yolks and add one tablespoonful milk for each egg, a saltspoonful of salt, a dash of pepper and a teaspoonful of flour. Put a teaspoonful of butter in a skillet and when it begins to bubble turn in the omelet. Fry to a golden brown, remove carefully from the skillet, spread with an acid jelly, fold over, and place in lettuce leaves. Beat the whites of the eggs stiff, sweeten slightly and put a thick coating on top the omelet.

Meat Omelet.—Mix two tablespoonfuls of chopped meat with the plain omelet and cook as directed. A little chopped parsley may be added. When the omelet is cooking, spread chopped meat over half the top and fold double. Oysters, whole or chopped, or stewed tomatoes, may replace the meat.

Ham and Eggs.—Fry the eggs in lard, and, after draining off all grease, lay them on a hot dish, with neat slices of fried ham around the edges. Trim the eggs to smooth edges, and cut the ham evenly in oblong pieces. Garnish with parsley.

Vegetables and Their Preparation.

In the cooking of vegetables it should be borne in mind that all woody tissues, whether in the roots or stalks, the husks or skins, are nearly devoid of nutriment and quite indigestible; they should, therefore, be removed. Vegetables should generally be boiled, this being continued long enough to disintegrate the tissues and allow the starch granules to break up. The saline and saccharine constituents being extracted by the water, vegetables lose some of their main elements—especially if the water be soft. This renders it advisable to add a little salt to the water. The salt also acts to preserve the color of green vegetables. The garden vegetables of this country are numerous and varied in character, and may be served in many ways. Chief among them are potatoes and tomatoes, which rank amid the most constant constituents of meals.

Boiled Potatoes (*with the skins*).—Select potatoes of uniform size, wash well in salted water and boil till a fork will penetrate with ease to the center of the largest. Then pour off the water, sprinkle with salt, and dry over the fire. Peel quickly and serve in an open dish.

Without the Skins.—Pare very thin, so as to preserve the starch, much of which lies next the skin. To this the mealiness of the potato is due. Leave them half an hour in cold water, then put in slightly salted boiling water and boil gently till tender. Drain, salt, and dry as above. Some varieties of potatoes cook best by putting on in cold water and bringing to a boil; others best as above directed.

Fried Potatoes.—Pare, wash and slice some new potatoes, or cold boiled potatoes, season with pepper and salt, and fry lightly in dripping or butter, turning them constantly until nicely browned.

Saratoga Chips.—Peel good-sized potatoes, and slice them as evenly as possible. Drop them into ice-water; put a few at a time into a towel and press, to dry the moisture out of them. Then drop them into a pan of simmering hot lard. Stir occasionally, and when of a light brown, sprinkle with salt; take them out with a perforated skimmer, shake both an instant. They will be crisp and not greasy.

Potato Croquettes.—Take two cups of cold mashed potato, season with a pinch of salt and pepper, and a tablespoonful of butter. Beat the whites of two eggs thoroughly and add. Make into small balls, dip them in the beaten yolks of the eggs, then roll either in flour or cracker crumbs; fry the same as fish-balls.

Baked Potatoes.—Wash some large potatoes, wipe, and bake in a quick oven till tender. Break the skins that the steam may escape. Serve in a napkin with the skins on. Three-quarters to an hour should suffice to cook them.

Lyonnaise Potatoes.—Cut cold boiled potatoes into cubes, season with salt and pepper. Fry two tablespoonfuls chopped onions in an equal quantity of beef dripping or butter till light brown; then put in the potato and cook till it takes up the fat. Add some chopped parsley and serve. The flavor will be improved by a teaspoonful of vinegar.

Creamed Potatoes.—Cut four cold potatoes into cubes or slices, and put them, with a half cup of milk, into a pan or double boiler; cook till they have absorbed nearly all the milk. Add two tablespoonfuls butter, cook five minutes longer, and serve hot. You may add to the seasoning a little chopped parsley.

Potato Puff.—Beat the yolks of two eggs and add salt and pepper. Add two tablespoonfuls butter to a cup of hot milk, mix it into the potatoes, and beat in the yolks. Beat the whites till stiff, and pour into the potato. Bake in a moderate oven about twenty minutes, or until the mixture browns and puffs up.

Roast Potatoes with Beef.—Pare potatoes and place in roasting pan with beef, basting when you do the beef; let bake until tender and brown.

Mashed Potatoes.—To four medium-sized potatoes, measure one tablespoonful butter, quarter teaspoonful salt, a sprinkle of pepper, eight tablespoonfuls milk, heated. Mash the hot potatoes in the saucepan in which they were boiled. Beat with a wire masher until light, and serve in a hot dish.

Brown Potato Balls.—Mash and season cold baked or boiled potatoes, or use cold mashed potatoes. Roll the potato mixture into balls, or pat into flat cakes. Place on a buttered tin, put a small piece of butter on top of each, and bake on the grate of a hot oven until golden-brown.

Surprise Balls.—Roll the potato balls as above, and with a teaspoon press a hollow in the top. Chop fine some cold, lean meat, season it with salt and pepper, and put one teaspoonful of the meat into the hollow of the potato ball. Put a little butter on the top of each ball, and brown in the oven on the grate.

Scalloped Potatoes.—Butter a baking dish, pare potatoes and slice them thin, put in dish a layer of potatoes, then a layer of onions, a few bread crumbs, sprinkle each layer with salt and pepper and butter, keep on this way till dish is nearly full, then fill with milk or cream, cover and bake one hour. The onions may be omitted.

Boiled Sweet Potatoes.—Choose potatoes of the same size, if possible. Put into boiling salted water, and cook till a fork will easily pierce the largest. Pour off water and let dry in oven for five minutes. Peel before serving.

Fried Sweet Potatoes.—Scrape and slice sweet potatoes, sprinkle a little salt over them, use lard and butter in frying-pan. put in potatoes and fry brown. Serve very hot,

Stewed Sweet Potatoes.—Use small sweet potatoes, pare and boil tender. Make thickening of cream and flour; pour over potatoes, let boil; add salt and pepper to taste.

Fried Tomatoes.—Wash the tomatoes and cut them in slices without removing the skin. Mix together, sprinkle pepper, quarter teaspoonful salt and tablespoonful flour, and dredge the slices thoroughly on both sides. Have ready in the frying pan enough melted butter to cover the bottom of the pan, and when hot lay in the tomatoes. When cooked, place them on a hot dish and keep them hot. Add half cup milk or water to the liquid in the pan. Melt and brown together half tablespoonful butter, half tablespoonful flour and quarter teaspoonful salt, and add the liquid from the pan. Pour through a wire strainer and serve with the tomatoes.

Stewed Tomatoes.—Pour boiling water on them to loosen the skins; peel and cut up, extracting all hard and unripe parts. Stew in a saucepan half an hour; then add salt and pepper, a teaspoonful white sugar, and a tablespoonful butter. Stew slowly fifteen minutes more. A little grated bread may be used for thickening.

Stuffed Baked Tomatoes.—Cut a thin slice from the blossom end of large, smooth tomatoes, scoop out the inside and chop it up fine with some grated bread, green corn,

butter, and a seasoning of salt, pepper and sugar. Mix well and stuff the hollowed tomatoes, replace the sliced pieces, bake three-quarters of an hour in a deep dish, until brown. Do not peel the tomatoes.

Scalloped Tomatoes.—Butter the sides and bottom of a pudding-dish. Put a layer of bread crumbs in the bottom, on which put a layer of sliced tomatoes, and season with salt, pepper and some bits of butter, and a very *little* white sugar. Then repeat with another layer of crumbs, another of tomato, and seasoning, until the dish is filled, having the top layer of slices of tomato, with bits of butter on each. Bake under cover until they are well cooked through; remove the cover and brown quickly.

Boiled Cabbage.—Wash the cabbage in cold water, trim off the limp outside leaves, cut into eight pieces, or, if it must be cooked quickly, chop it into smaller pieces. Put it into a kettle and cover with boiling water, allowing one-half teaspoonful salt to each quart of water. Do not cover the kettle and there will be very little of the cabbage odor in the house. A young cabbage requires about thirty minutes to cook. When the cabbage is done the water may be drained off, and a little milk, one tablespoonful butter, one teaspoonful salt, and a sprinkle of pepper added. Boil up once and serve.

Vinegar is generally placed on the table with boiled cabbage. Drawn butter may be eaten with it, and is an improvement. Cabbage may be boiled in the water in which corned beef or ham has been cooked.

Cooked Cabbage.—Chop cabbage fine, cook in kettle with enough water to cover; season with salt, pepper and meat drippings. Serve with vinegar.

Stewed Cabbage.—Cut a hard white head of cabbage in two pieces, cut one piece as fine as possible, and put in a stew-pan with a piece of butter the size of an egg. Salt and pepper, sprinkle with flour and sugar, and a little water, and let cook. Make a dressing of one egg, one teaspoonful cream, one cup of weak vinegar. Pour over cabbage about five minutes before removing from fire.

Ladies' Cabbage.—Boil a firm white cabbage for fifteen minutes, drain and add fresh boiling water. When it grows tender, drain and set aside until cold. Chop fine; add two beaten eggs, a tablespoonful of butter, some pepper and salt, and three tablespoonfuls of rich milk or cream. Stir all well together, and bake in a buttered pudding-dish until brown. Serve very hot. The prepared cabbage resembles cauliflower and is a very digestible and palatable dish.

Sour-crout.—Barrels having held wine or vinegar are generally used in which to prepare sour-crout, but it is better to have a special barrel for the purpose. Slice white and firm cabbages into fine shreds. There are instruments for this purpose. At the bottom of the barrel place a layer of coarse salt, and add alternately layers of cabbage and salt, being careful to have one of salt on the top. As each layer of cabbage is added, it must be forced down with blows of a heavy pestle, fresh layers being added as soon as the juice floats on the surface. The cabbage should be seasoned with a few grains of coriander, juniper berries, etc. When the barrel is full it must be put in a dry cellar, and covered with a cloth, under a plank, on which heavy weights are laid. At the end of a few days it will begin to ferment. During this process the pickle must be drawn off and replaced by fresh, until the liquor becomes clear. This should be done every day. Finally, renew the cloth, wash the cover, replace the weights, and let stand for a month. By that time the sour-crout will be ready for use. Care must be taken to let the least possible air enter the sour-crout, and to have the cover perfectly clean. Each time the barrel has to be opened it must be carefully closed again. To neglect these precautions may ruin the operation.

Sour-crout is often fried in the same manner as fried cabbage, excepting that it is first boiled until soft in just enough water to cook it. Vinegar should be added after frying.

Boiled Cauliflower.—Take off leaves and cut stalk close to flower bunch. Soak in cold water half an hour, then tie in coarse bobbinet lace or cheese-cloth to

prevent breaking, put into boiling salted water and cook until tender. Serve with drawn butter.

Scalloped Cauliflower.– Boil until tender, cut up and pack, stems downward, in a buttered pudding-dish. Take a cup of breadcrumbs, add two tablespoonfuls melted butter and six of milk; beat to a soft paste, season with salt and pepper, add a beaten egg, and cover the cauliflower. Cover the dish and bake in a hot oven six minutes. Remove cover and brown. Serve hot.

Boiled Onions.—Place onions in cold water and peel. Then cover with boiling water in a saucepan. Cook fifteen minutes, drain, and cover again with boiling water. Repeat this twice; cook until they can be pierced with a wire skewer. Drain and season with salt, pepper, and plenty of butter. Serve with drawn butter.

Fried Onions.—Peel, slice, slightly parboil, drain, and fry until brown in equal quantities of lard and butter. Cover until they are perfectly soft, then remove the cover, cook until brown, and season with salt and pepper.

Boiled Green Corn.—Test corn with finger nail. When the grain is pierced the milk should jet out, and not be thick. Strip off the outer leaves, turn back the inner covering, and pick off all the silk. Then replace the inner husks. Put into salted boiling water, and cook fast for from ten to twenty minutes, according to size and age of the ears. Cut the stalks off close to the cob, and send to table wrapped in a napkin.

Or the corn may be cut from the cob while hot, and seasoned with butter, salt, and pepper. Serve hot in a vegetable dish.

Green Corn Fritters.—Grate the corn; use with each cupful an egg and a half and a tablespoonful milk or cream. Beat the egg, and gradually add the corn, still beating. Put a tablespoonful of melted butter to the pint of corn; stir in the milk, and thicken with a little flour. Salt to taste. Fry in hot lard, or cook on a griddle, like batter cakes.

Baked Corn.—To two cups of chopped corn (either fresh or canned) add two beaten eggs, one-half teaspoonful salt, speck of pepper, one tablespoonful melted butter, and two cupfuls scalded milk. Bake in a buttered pudding dish until firm.

Corn Pudding.—Scrape or grate the corn from a dozen ears of tender green corn. Beat separately the whites and yolks of four eggs. Mix the corn and yolks, and stir hard while adding two tablespoonfuls of butter. Then add one quart of milk, a tablespoonful of sugar and a little salt and pepper, and lastly the whites of the eggs, stirring constantly. Bake slowly at first, covering the dish, for an hour. Then take off the cover and brown. This pudding can be made from canned corn in winter, by chopping the corn fine. It is a delicious accompaniment to a meat course.

Stewed Corn.—Shave corn off the ear; to three pints of corn add three tablespoonfuls of butter, pepper and salt to taste, and just enough water to cover; place in pan, cover and cook rather slow, from half hour to an hour, stirring often; just before it is done, add a half cup sweet cream thickened with a little flour.

Scalloped Corn.—Cut corn off the cob, put into baking dish a layer of corn, then a layer of breadcrumbs, sprinkle with salt, pepper and lumps of butter, then a layer of corn, putting corn on top with lumps of butter, and pour in cream or milk till quite moist. Bake thirty minutes.

Green Beans.—To cook green beans (fresh from the vines) without pork, have the kettle hot, and put in a tablespoonful of lard, let it get hot, stir in the lard one tablespoonful of flour, let brown a little, then pour in a half gallon of cold water, then add beans, salt and pepper to taste. Cook until tender.

String Beans.—Break off the end that grew to the vine, drawing off at the same time the string upon the edges. Repeat this process from the other end; cut the beans with a sharp knife into pieces half an inch long, and boil them in just enough water to cover them. They usually require two and a half hour's boiling; but this depends upon their age and freshness. After they have boiled until tender, and the water

boiled nearly out, add pepper, salt, a tablespoonful of butter, and a half a cup of cream.

Lima and Butter Beans.—Soak a while in cold water; then put into a pot well filled with boiling water and a little salt. Boil until tender. Drain and butter well when dished. The average time to cook is forty minutes.

Boston Baked Beans.—Soak one quart of pea beans over night. Drain, cover with fresh water to which half teaspoonful of soda has been added and cook slowly until the skins wrinkle. Drain again and put in bean pot with half pound salt pork, half tablespoonful salt and two tablespoonfuls molasses. Cover with boiling water and bake at least eight hours. The pork should be buried in the beans, leaving the rind exposed.

Succotash.—This is made of green corn and Lima, string, or butter beans. The corn, when cut from the cob, should be a third more than the beans. Just cover with boiling water, and stew together until tender, stirring now and then. Then pour off nearly all the water, add a large cupful of milk, and stew for an hour, watching to prevent burning. Stir in a large lump of butter, a teaspoonful of flour moistened with milk, pepper and salt. Boil up once, and serve in a deep vegetable dish.

Green Peas.—Take fresh peas, hull them, put in pan in cold water for half an hour, and cook twenty or thirty minutes in small quantity of boiling water. Drain, season with pepper and salt and plenty of butter. Serve hot.

Boiled Peas or Beans.—Choose fresh, green peas or beans. Put them into a kettle with just enough boiling water to keep them from burning. Boil until they are soft. To one pint of the vegetables add one tablespoonful butter, a sprinkle of pepper, and a little salt, if necessary. Serve in a hot dish.

Dried Peas or Beans.—Pick them over and remove specks, pebbles, and faulty peas or beans. Soak in cold water a few hours or over night. Pour off the water, add fresh cold water, and set on the back of the stove to heat slowly, and simmer until soft. If desired to use as soup, they may be boiled until they fall to pieces and form a soft, pulpy mass. Split peas need to be soaked only half an hour before cooking.

Boiled Beets.—Take small, smooth beets; wash carefully, and put into boiling water. Boil an hour or two, or until tender. Do not probe them, but press with fingers to see if they are done. Take up, lay in a pan of cold water, and peel. Cut into slices, season with salt, pepper, butter, or vinegar. Serve hot.

Cooked Beets with Dressing.—Cook beets and slice in saucepan, and pour the following dressing over them: One small teacupful vinegar (if strong dilute with water), a tablespoonful each of sugar and butter. Salt and pepper to taste. One tablespoonful of corn starch, dissolved in water; stir all together and boil until thick; pour over the beets, and send to the table in a covered dish.

Boiled Beets.—Scrub the beets without breaking the roots. Boil until they can be easily pierced with a skewer. Young beets require thirty or forty minutes to cook; old beets from one to two hours. When done dip into cold water, rub off the skin, cut off the tops and roots, and slice. Sprinkle with salt and pepper, and pour on melted butter and serve. Never boil beets with any other food, on account of their color.

Spinach.—Pick off the roots and decayed leaves; wash thoroughly in three or four waters. Put the spinach into a large kettle, without water. Put it on the back part of the stove where it will cook slowly, until some of the juice is drawn out, then boil until tender. Drain, and chop if liked. To one-half peck of spinach add one tablespoonful butter, one-half teaspoonful salt, and a sprinkle of pepper. Heat again. Garnish with hard-boiled eggs.

Fried Egg-plant.—Cut the egg-plant into slices one-quarter inch thick; salt each slice separately, putting one on top of another; put on the upper slice a heavy weight to press out the juice, and let stand about half an hour. Dip in beaten egg, then in cracker dust or breadcrumbs, or the two mixed; fry quickly in hot lard to a rich brown.

Stuffed Egg-plant.—Cut the egg-plant in two, and scrape out the inside, which put into a saucepan with a little minced ham. Cover with water and boil until soft, then drain off the water and add two tablespoonfuls of grated crumbs, a tablespoonful of butter, half a minced onion, salt and pepper. Stuff each half of the shell with this mixture, to each add a small lump of butter, and bake fifteen minutes. Minced veal or chicken in the place of ham is equally good, and many prefer it.

Stewed Salsify or Oyster-plant.—Scrape the roots and place in cold water, to prevent discoloration. Cut in inch-long pieces. Cover with hot water in a saucepan and boil tender. Then pour off most of the water, and add a cup of milk. Bring this to a boil, stew ten minutes, put in a large lump of butter, cut and rolled in flour; season to taste; boil up once, and serve. This dish has much the taste of stewed oysters.

Asparagus.—Break asparagus stalks in pieces any desired length; boil until tender; season with salt, pepper, and plenty of butter; thicken with a tablespoonful of flour, mixed with milk. If desired, serve on toast. The tops, which are tender, should be placed in the water ten minutes after the other pieces begin to boil.

Asparagus.—Boil a bunch of asparagus twenty minutes, or until tender. Place in a baking dish, add butter, pepper, and salt to taste. Beat well four eggs, add two tablespoonfuls of good cream; pour over the asparagus and bake ten minutes.

Boiled Turnips.—Scrub the turnips and pare off the thick skin. Cut into slices or quarters, and cook in boiling salted water until soft. Then put them into a piece of coarse cheese-cloth and mash fine with a wooden masher, pressing them to remove the water. To one pint of mashed turnips add one tablespoonful butter, one-quarter teaspoonful salt, and a sprinkle of pepper. Serve in hot dish. Potatoes are sometimes mashed with turnips, to absorb the water.

Carrots.—Scrub and scrape off a very thin skin. Cut each carrot into slices from one-quarter to one-half inch thick, and cook in boiling salted water until soft. Serve with a white sauce.

Stewed Carrots.—Wash and scrape the carrots, and cut them into strips. Put these in a stewpan with water enough to cover them, add a spoonful of salt, and boil slowly until they are tender. Then drain and replace them in the pan, with two tablespoonfuls of butter rolled in flour, a little pepper and salt, and enough cream or milk to moisten the whole. Bring to a boil and serve hot.

Parsnips.—Scrub, scrape off a thin skin, cut each parsnip into quarters lengthwise, and cook in boiling salted water, from thirty to forty minutes, until soft. Place in a dish and pour a white sauce over them, or serve with vinegar on the table. They may be buttered after boiling, placed in the oven and baked a golden brown.

Fried Parsnips.—Wash and scrape parsnips, quarter and remove heart, cut in pieces about two inches long, salt and pepper. Mix butter and lard in frying-pan, put them in and fry till a nice brown.

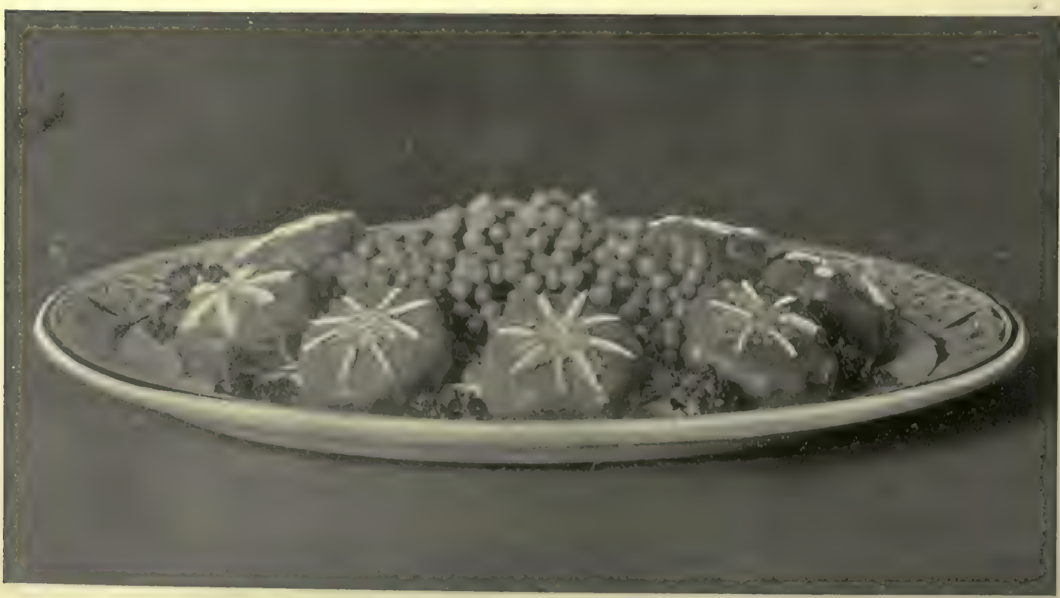
Parsnip Balls.—Wash and boil in water with a little salt, cook till perfectly tender. When cold scrape off the skin, mash them, and for each cup of the mashed parsnips, add one-half cup breadcrumbs and one egg, salt and pepper. Flour the hands and make into balls, brown in hot butter, and serve very hot.

Summer Squash.—When young and tender, this can be fried in the same manner as egg-plant. Winter squash takes much longer to cook, and should be soaked in cold water for two hours or more before cooking. Cold stewed squash can be used by taking two cups of squash, two eggs, two tablespoonfuls of flour, one-half cup of milk, and a small piece of butter. Fry in hot lard.

Stewed Pumpkin.—Cut in two, remove the seeds, slice, and pare. Soak for an hour in cold water, then put in boiling water and stew gently, stirring often. When the pieces grow tender and break, drain and squeeze dry, rub through a colander, and return to the pan with a

ROLLED RIB ROAST WITH RICED POTATOES.

Remove the bones from a rib roast and skewer the meat into a round shape; dredge with flour and set, on a rack in dripping pan, into a hot oven. When the outside of the meat is seared over, add a little drippings melted in hot water; reduce the temperature of the oven and bake, (weight from six to eight pounds) from sixty to ninety minutes. Baste often with the drippings in the pan and dredge with flour after each basting; add salt to the flour when half cooked. When cooled substitute silver skewers for those used in the oven. Garnish with a stem of watercress and surround with *Riced Potatoes.* Pass through a ricer about eight hot boiled potatoes; add three tablespoonfuls of butter, half a teaspoonful of salt, and about a half a cup of hot milk or cream, beat thoroughly with perforated cake spoon, and pass through the ricer, or vegetable press, around the meat.



MEDALLIONS OF MUTTON WITH GREEN PEA SALAD.

Remove the bones and fat from lamb or mutton chops, and skewer the meat in rounds. Braise the meat with the bones and fine-cut vegetables until tender; let cool under a weight, cover with brown chaudfroid sauce, decorate with white and yolk of egg, and brush over with liquid aspic. Serve cold with cooked peas dressed with French dressing.

Brown Chaudfroid Sauce.—To a cup of highly seasoned brown sauce add the yolk of an egg, diluted with one-fourth a cup of cream and a scant tablespoonful of gelatine softened in three tablespoonfuls of stock. Use when cold, but still liquid.

seasoning of butter, salt and pepper. Stir rapidly from bottom till very hot. Dish in a mound shape.

Vegetable Hash.—Chop up coarsely the vegetables left over from dinner—cabbage, parsnips, potatoes, beans, etc. Sprinkle them with a little pepper. Take a saucepan or frying-pan, oiling its sides and bottom with melted butter; then put in the chopped vegetables, pour in a few spoonfuls of hot water, and cover quickly to keep in the steam. When thoroughly heated, remove the cover and stir the mixture till well cooked. Serve hot.

Milk and Cheese.

Milk should be kept covered with a cloth to prevent it from absorbing impurities from the air. It should be sterilized for babies and young children; especially during warm weather. Vessels used for milk should be kept perfectly clean. Rinse them out after using, fill them with water in which a teaspoonful of borax or washing soda has been dissolved and let them stand an hour. Then wash them in hot soap-suds, scald them, rinse again and let them cool.

Sterilized Milk.—Sterilize milk bottles or jars by boiling them twenty minutes in water. Remove them, fill two-thirds full of milk, and cork with baked or prepared cotton or with rubber corks which have been sterilized. Place the bottles on a wire stand in a kettle of cold water, heat the water gradually to 165 degrees Fahrenheit, and keep it at that temperature forty minutes; then remove the bottles and cool quickly by placing them in cold or iced water. Keep the bottles in a cool place.

A thermometer for testing the temperature may be bought at any pharmacy, but if there is none at hand heat the milk until a scum forms over the top, and keep it as nearly as possible at that temperature for forty minutes. Do not allow it to boil.

Cold Custard or Junket.—Warm one quart new sweet milk, add two tablespoonfuls sugar, and stir until the sugar is dissolved. Pour the mixture into a glass or china dish and add one tablespoonful liquid rennet, and set it in a warm place. If, at the end of an hour, it has not begun to harden, stir in one teaspoonful more of rennet; it should be firm in one or two hours. Remove it to a cool place or set it on ice to cool. It should be eaten within an hour after it has hardened or it will separate into curds and whey. Serve with cream. Cold custard may be flavored with nutmeg grated over the surface, or a teaspoonful of vanilla extract or rosewater stirred in with the rennet.

Cornstarch Blanc Mange.—Scald a pint of milk in a double boiler. Add one tablespoonful sugar and a sprinkle of salt, with some mashed or preserved strawberries or a little cocoa, mixed with some cold milk. Mix two tablespoonfuls cornstarch with cold milk, stir it into the hot milk, boil and stir five or ten minutes, until it is smooth and thick. Pour the mixture into cold wet cups or molds. Serve cold with cream or milk and sugar.

Toast and Cheese.—Prepare toast; dip in hot, salted water; grate enough dry cheese to cover the slices; set in the oven to melt, and put the slices together as sandwiches. This may be enriched in various ways by adding egg, butter, and spices.

Cheese Pudding.—Butter a baking dish, put in a cup of grated breadcrumbs and a half cup grated cheese in layers, or mix and keep some crumbs for the top. Beat an egg slightly, add a half cup of milk, salt and cayenne pepper; pour in baking dish, add a top layer of crumbs and bake till brown.

Rice and Cheese Pudding.—Pick over and wash a cup of rice. Steam until soft in salted water, in a double boiler. Butter a baking dish, put in the rice and two cups of grated cheese in layers, pour on one cup of white sauce. Sprinkle over it buttered cracker crumbs and brown in the oven. Macaroni may be used in the same way.

Welsh Rarebit.—Take half pound grated cheese and quarter cupful milk or cream, put into a double-boiler, and stir until the cheese is melted. Beat one egg, and add mustard, salt, and cayenne pepper; then pour the milk and cheese over the mixture. Add a teaspoonful of butter, return to the boiler, and cook until it thickens, stirring constantly. Pour it over dry toast.

Cheese Sticks.—Take one pint flour, one-half pint grated cheese; mix and make paste with lard the size of an egg; make the same as pie crust. Roll out and cut in strips one half inch wide and five inches long; sprinkle over top with grated cheese and bake a light brown.

Cheese Straws.—One cup of grated cheese, one-half cup butter, three-fourths cup of flour, sifted, one small teaspoonful dry mustard, four teaspoonfuls of cold water; mix all together and roll out like pie crust, cut into strips half-inch broad and five inches long. Bake a light brown and serve with salads.

Macaroni With Cheese.—Take twelve sticks of macaroni broken into one inch lengths, and cook in three pints of boiling salted water twenty minutes; turn into a colander and pour over it cold water; drain, make a sauce of one tablespoonful each of butter and flour, and one and one-half cups of hot milk; salt and pepper to taste; put a layer of grated cheese in the bottom of baking dish, then a layer of sauce, then macaroni, and sauce, cover this with fine breadcrumbs; bake until brown.

Sauces and Salads.

Drawn Butter.—Take one and one-half teaspoonfuls flour, make of it a thin paste with cold water, and stir it into a teacupful of hot water. Bring to a boil, and add by degrees two ounces of butter, stirring till well mixed. Boil one minute.

Tomato Sauce.—Heat one tablespoonful of butter; cook in it a teaspoonful chopped onion until golden brown; stir in one tablespoonful flour, and cook till smooth. Add one-half cup water or stock gradually, pour in one cup of strained tomato, add salt and pepper, boil five minutes, and strain. Serve with boiled macaroni, or boiled or baked meat.

White Sauce.—Take two tablespoonfuls each butter and flour. Melt the butter in a saucepan. Stir in the flour and work in the butter until smooth. Cook it, stirring until the flour swells and is smooth. Add one cup scalded milk gradually, and boil, stirring constantly until the mixture

thickens. Stir in a seasoning of salt and pepper and serve hot.

Use one tablespoonful flour when making the sauce for macaroni. A brown sauce may be made by browning the butter before the flour is added.

Macaroni Served With White Sauce.—Break macaroni into pieces one or two inches long, and cook in boiling salted water until tender. It will require from thirty minutes to one hour. Drain off the boiling water and pour cold water over the macaroni. Stir the macaroni into the white sauce and heat it. One cup of macaroni is the proportion for the quantity of white sauce in the above recipe. Two tablespoonfuls grated cheese stirred into the white sauce improves it.

Vegetables Served With White Sauce.—Asparagus, tied in bunches and cooked in boiling salted water, carrots, turnips, parsnips and potatoes, boiled and cut in slices or cubes, may be served with white sauce.

Bread, Biscuit and Pastry.

Bread is one of the most important articles of diet. It is made of flour, salt, water, and yeast.

The flour best adapted for bread-making is that from wheat, because it will produce the most appetizing and nutritious loaf at the least cost. The quality of wheat bread depends to a great extent upon the kind of flour used, whether whole-wheat, Graham, or bread flour (as the ordinary flour is called).

The so-called bread flour is made by grinding the wheat, screening out the bran and sifting the flour through linen or bolting cloth several times, thus making a fine white flour composed chiefly of starch and gluten. The whole-wheat flour differs from this in that the whole grain is ground fine, thus obtaining more gluten and some mineral matter, both of which lie close to the bran.

Graham flour is made from the whole grain ground coarse.

Both the whole-wheat flour and the Graham are dark in color and make dark bread.

Pastry flour contains a very small amount of gluten, and is used for pies and cakes.

There are certain general rules by which good bread flour can be tested.

First. It should have a yellowish tinge.

Second. When pressed in the hand it should fall loosely apart.

Third. When rubbed between the fingers it should feel slightly granular.

In bread-making an indispensible requisite is good yeast; and though modern bread and cake makers avail themselves largely of baking powders, a recipe for satisfactory yeast is of the first importance. The one given below has the warrant of experienced housekeepers.

Excellent Yeast.—Boil two ounces of the best hops in four quarts of water for half an hour; then strain and let stand until lukewarm. Put it in an earthen bowl, add half a cupful each of salt and brown sugar, and a quart of flour; mix all well together, and let it stand forty-eight hours. Now add six medium sized potatoes, which have been boiled and mashed through a colander, and let stand for another day, then strain and bottle and it is fit for use. While making it must be kept near a fire and often stirred. This yeast ferments of itself and needs the aid of no old yeast. If care be taken to let it ferment sufficiently in the bowl, it may immediately be corked tightly. Be careful to keep it in a cool place, and before using shake the bottle briskly. It will keep in a cool place two months, and is best the latter part of the time. Use about the same quantity as of other yeast.

Yeast Cakes.—Boil one quart pared and sliced potatoes and a double handful of hops (tied in a muslin bag) in two quarts of water for nearly an hour. Then take out the hops and strain the remainder through a colander into a bowl. Stir into the hot liquid flour enough to make a stiff batter, beat up well, add two tablespoonfuls of lively yeast, and set to rise in a warm place. When light stir in a cup of Indian meal, roll into a thin sheet, and cut into round cakes. Dry these in a very moderate heat, and when quite dry and cold place them in a cool dry place. For a fair-sized loaf use a cake three inches in diameter, soaking until soft and adding a little soda. These cakes will keep a month in summer, two months in winter.

Wheat Bread.—Take a cup of lukewarm milk, or of water with a teaspoonful of butter, a quarter cake yeast dissolved in a quarter cup of lukewarm water, or a quarter cup of liquid yeast, flour to make a stiff dough (three and quarter to three and half cups) one teaspoonful sugar and one teaspoonful salt.

Scald the milk, add the sugar and salt, and cool it until lukewarm. Dissolve the compressed yeast in the lukewarm water, and add it. Stir in flour to make a dough stiff enough to handle. Scrape the dough out on a floured board, and knead it about fifteen minutes. It should be smooth and elastic, so that when pressed with the finger the dough springs back. Put the dough back into the bowl. Cover with a towel, and set it in a warm place and let the dough rise until double its bulk. Then lay it on a board and knead it again about fifteen minutes, using as little flour as possible. Shape it into biscuit or loaves, lay them in a greased pan, let them rise in a warm place, until double their bulk, and bake on the floor of a hot oven. Biscuit will require from twenty to thirty minutes, and loaves from forty-five minutes to one hour. If the dough is mixed with water, a little butter may be added to prevent the bread from being tough. The butter should be added to the lukewarm water. The quantity of yeast in the recipe will raise the dough to double its bulk in about six hours; one-third of a cake of yeast will raise it in about four hours, and one-eighth of a cake will raise it in about twelve hours. When the bread is baked take it out of the pan and let it stand uncovered, that the air may circulate around it. When it is perfectly cold put it away in a clean, dry tin box. Do not wrap it in cloth, as the cloth absorbs the moisture in the bread and destroys it flavor.

Bread Made with a Sponge.—Use recipe for bread, stirring in only enough flour to make a thick batter. Let the batter rise over night. In the morning add flour to make a stiff dough, and knead or beat it until it is smooth. Mold it lightly into loaves or biscuits. Let them rise until

double their bulk, and bake. A potato may be mashed and stirred into the batter before it is set away to rise.

Graham Bread.—Take one teacupful of wheat flour, a half teacupful each of molasses and of good yeast, a teaspoonful of salt, and a pint of warm water. Mix these and add sufficient Graham flour to make the dough as stiff as can be stirred with a strong spoon. Set this over night, and in the morning add one teaspoonful of soda, dissolved in a little water. Mix well, and pour into two medium-sized pans, which should be about half full. Let stand in a warm place until the dough rises to the top of the pans, then bake one hour in a fairly hot oven.

The loaves should be covered when first put into the oven with a thick brown paper, or an old tin cover; this prevents the upper crust hardening before the loaf is well risen. If these directions are correctly followed the bread will not be heavy or sodden.

Graham Bread.—Mix the sponge or batter, using a pint of lukewarm water, half a teaspoonful salt, half yeast cake and one cup flour. When light, stir in three tablespoonfuls molasses and beat until it is thoroughly mixed; then add enough Graham flour to make a soft dough. Knead it ten minutes, shape it into two loaves, and put it in greased pans to rise. When light, bake in a moderate oven about thirty minutes. The bread may be made without any white flour.

Entire Wheat or Whole Wheat Bread.—Use recipe for Graham bread substituting whole wheat flour for the Graham.

Soft Graham Bread.—Mix together two cupfuls Graham flour, one cupful white flour, one teaspoonful salt, four tablespoonfuls molasses, one tablespoonful butter or lard and lukewarm water to make a soft dough, add half a yeast cake dissolved in half a cupful of lukewarm water. Beat thoroughly and allow it to double its bulk. Beat again, and pour into greased pans. Let it double its bulk. Bake in moderate oven.

Boston Brown Bread.—Mix together thoroughly two cupfuls of rye meal or Graham flour, one cupful corn meal, one-half teaspoonful salt, and one-quarter teaspoonful soda. Add two cupfuls of milk and one-half cup molasses. Fill a greased mold two-thirds full, cover it and steam six hours or longer. The longer it is steamed the darker and richer it becomes.

Boston Brown Bread.—Mix one pint of rye flour, one quart of corn-meal, one teacupful of Graham flour, half a teacupful of molasses or brown sugar, a teaspoonful of salt, and two-thirds of a teacupful of yeast. Stir this with a spoon into as stiff a dough as you can, using warm water for wetting. Let it rise several hours, or over night. In the morning, or when light, add a teaspoonful of soda dissolved in a spoonful of warm water; beat well and turn into well-greased deep pans, and let it rise again. Bake in a moderate oven from three to four hours.

Boston Brown Bread (Unfermented).—Stir thoroughly together, wetting with sour milk, one cupful of rye flour, two cupfuls of corn meal, one cupful of white flour, half a teacupful of molasses or sugar, and a teaspoonful of salt. Then add a level teaspoonful of soda dissolved in a tablespoonful of water. Sweet milk may be used by substituting baking-powder for soda. The batter must be stirred thick with a spoon, and turned into well-greased pans.

Virginia Brown Bread.—Take a pint of corn-meal, and thoroughly scald with boiling water. To this, when cool, add a pint of light, white bread sponge, mix well, and add a cupful of molasses, and Graham flour sufficient to mold. When light bake for an hour and a half in a moderate oven. The quantities here given will make two loaves.

Boston Corn Bread.—Take one cupful of sweet and two of sour milk, two-thirds cupful of molasses, a cupful of wheat flour, four cupfuls corn-meal, and a teaspoonful of soda. Steam for three hours and brown in the oven a few minutes. If made with sweet milk and baking-powder it is equally good.

Corn Bread.—Beat thoroughly two eggs—whites and yolks separately. Mix two heaping cupfuls of Indian meal and one cupful of flour, adding a teaspoonful of melted lard and milk enough to make a thin batter. Put into the flour while yet dry a teaspoonful

of soda and two of cream-of-tartar. Put in the eggs last. Beat very briskly. Bake quickly in a buttered mold; a half hour is usually time enough. All kinds of corn bread should be eaten while hot.

Corn Pone.—To one quart of corn meal mush, add one and one-half pints cold water; stir well and add corn meal to make soft batter. Let stand over night in a warm place. In the morning add one cupful buttermilk, a level teaspoonful soda, one egg beaten light, one tablespoonful salt, three-fourths cupful sugar, two tablespoonfuls flour. Add enough meal to make it about as stiff as common corn bread and bake one hour and a quarter in a moderate oven.

Johnnie Cake.—Sift into a pan one quart of Indian meal, and, making a hole in the middle, pour in a pint of warm water, and add a teaspoonful of salt. Mix the meal and water with a spoon into a soft dough; then stir very briskly for a quarter of an hour or more, till it becomes light and spongy. The dough must next be spread evenly on a straight, flat board, and the board be placed nearly upright before an open fire, with some support to hold it in position. Bake well; when done, cut into squares; send hot to table, split and buttered.

New England Corn Cake.—Take a quart of milk, a pint of corn meal, a teacupful of wheat flour, a teaspoonful of salt, and two tablespoonfuls of melted butter. Scald the milk, and pour it gradually on the meal. When cool, add the butter and salt, and half a cupful of yeast. Let set over night. In the morning beat the sponge thoroughly, and add two well-beaten eggs, and half a teaspoonful of soda dissolved in a teaspoonful of water. Pour into buttered deep earthen plates, let stand fifteen minutes to rise again, and bake from twenty to thirty minutes.

Corn Meal Griddle Cakes.—Scald two cupfuls of sifted corn meal and mix with a cupful of wheat flour and a teaspoonful of salt. Add three well-beaten eggs; thin with enough sour milk to make the mixture the right consistency. Beat the mass till very light, and add a teaspoonful of baking-soda dissolved in a little water. If you use sweet milk, replace the soda with two large teaspoonfuls of baking powder.

Lunch Biscuit.—To enough raised dough to make a loaf, add one-half cupful sugar, one-half cupful lard, and mix thoroughly. Roll to one-fourth inch thickness and cut with biscuit cutter, place them in pan one on top of the other, with piece of butter the size of a pea between them. Let raise and bake.

Rusk.—Two teacupfuls raised dough, one teacupful sugar, half cupful butter, two well-beaten eggs, flour enough to make a stiff dough; set to raise, and, when light, mold into high biscuit and let raise again, sift sugar over top and wet with milk, place in oven.

Parker House Rolls.—Scald a pint of milk, melt in it while warm a piece of butter the size of an egg, add a tablespoonful of sugar, a pinch of salt, and a cupful of yeast. Add flour to make soft dough and let it rise over night.

In the morning add half a teaspoonful of soda dissolved in a spoonful of water. Mix in enough flour to make the same stiffness as any biscuit dough, and roll out about a quarter of an inch thick. Cut with a large round cutter, spread soft butter over the tops, and fold one-half over the other by doubling. Cover, and place near the fire for fifteen or twenty minutes to rise before baking. Bake in rather a quick oven.

French Rolls.—These may be made of the bread dough prepared for baking. When making bread, reserve enough dough for rolls. Work into this a tablespoonful of lard or butter, and stand in a cool place for four hours. Knead again, and let stand three hours more. Then roll, very lightly, pieces of the dough into round cakes, and fold these over, not quite in the centre. Let rise again an hour, and bake half an hour in a hot oven.

Risen Biscuit.—Mix one quart milk, three-quarters of a cupful each lard or butter and yeast, two tablespoonfuls white sugar, and a teaspoonful of salt, with flour enough to make a soft dough. Set over night. In morning roll out into a sheet three-quarters of an inch thick. Cut into round cakes, set close together in a pan, let rise twenty minutes, and bake twenty minutes. Or half

the flour may be worked in, and the remainder five hours later, the dough being left to rise five hours more.

Gluten Bread.—Scald a pint of milk; when lukewarm, add the whites of two eggs slightly beaten, and one yeast cake dissolved in two tablespoonfuls of warm water; add sufficient gluten flour to make a thick batter. Beat for five minutes; cover, and stand aside for three hours; then add sufficient flour to make as thick a batter as you can handle with a spoon. Turn it into a greased square pan, and when it is very light (about one hour) bake in a moderately quick oven for three-quarters of an hour.

Gluten Muffins.—Separate two eggs; beat the yolks; add a pint of milk. Add to this a half pint of gluten flour, a half teaspoonful of salt. When thoroughly mixed, add a rounding teaspoonful of baking powder; stir in the well-beaten whites of the eggs. Bake in greased hot gem pans in a moderate oven twenty minutes.

Sally Lunn.—Warm one-half cupful of butter in a pint of milk; add a teaspoonful of salt, a tablespoonful of sugar, and two quarts of flour. Beat thoroughly, and while the mixture is warm, add four well-beaten eggs, and, lastly, four tablespoonfuls of yeast, which beat in well. Set it to rise over night in a buttered dish. In the morning, dissolve half a teaspoonful of soda, stir it into the batter, and set it to rise again about fifteen or twenty minutes. Bake steadily three-quarters of an hour, or until a straw thrust in comes out clean.

This cake should be torn apart, not cut. Cutting is apt to make warm bread heavy. Bake a light brown. Eat while hot.

English Crumpets.—To a quart of warm milk, add half a cup of yeast, a teaspoonful of salt, and flour enough to make a stiff batter. When light, rub in half a cupful of melted butter, a teaspoonful of soda dissolved in a little water, and a very little more flour. Let stand twenty minutes or until light. Next grease some muffin rings, place them on a hot griddle, and fill them half full of the batter. When done on one side, turn and bake the other side. Butter them while hot, pile one on another, and serve at once.

Rice Cakes.—Take one cup cold boiled rice, one pint flour, two well-beaten eggs, a teaspoonful salt, and milk to make a moderately thick batter. Beat well together and bake quickly.

Flannel Cakes.—A quart of milk, a tablespoonful of butter, two well-beaten eggs, a teaspoonful of salt, and three tablespoonfuls of yeast, with flour enough to make a good batter. Set at night as a sponge, and add the butter and eggs in the morning.

Buns.—Break one egg into a cup and fill with sweet milk; mix with it half cupful yeast, half cupful butter, one cupful sugar, enough flour to make a soft dough; flavor with nutmeg. Let rise till very light, then mold into biscuits; let raise a second time in pan, bake, and, when nearly done, glaze with cream and sugar.

Coffee Cakes.—To one quart light dough add one cupful sugar, one-half cupful butter, one cupful raisins, and season with cinnamon or nutmeg to taste; let raise, then roll out in large round cakes; set the other half away in a can in a cool place until you wish to bake again.

Biscuit.—One quart flour, one teaspoonful salt, one of soda, sift together and rub in one tablespoonful of lard, sour milk to make a soft dough, bake immediately in a quick oven. If milk is not very sour use less soda.

Tea Biscuit.—Sift together one quart of flour and three teaspoonfuls baking powder, rub in a tablespoonful lard, one-half teaspoonful salt. Mix with enough sweet milk or water to make as soft a dough as can be handled. Roll and cut out biscuit.

Soda Biscuit.—Rub into a quart of sifted flour two tablespoonfuls lard, one teaspoonful salt, one scant teaspoonful soda, two of cream of tartar. Mix with one pint milk, or enough to make a very soft dough. Roll and cut one-half to one inch thick with biscuit cutter; bake in quick oven.

Graham Muffins.—Mix together thoroughly one and one-quarter cupfuls Graham flour, one cupful white flour, scant teaspoonful soda, and a teaspoonful salt. Add

one-third cupful of molasses and one cupful sour milk. Bake in greased gem pans.

Muffins.—One cupful milk, one-half teaspoonful each of butter and lard melted, a little salt, three teaspoonfuls baking powder, flour to make batter like cake. Bake in quick oven.

Corn Meal Muffins.—Two eggs, two tablespoonfuls granulated sugar, one cupful sweet milk, one cupful of granulated corn meal, one and one-half cupfuls sifted flour, three teaspoonfuls baking powder, and a pinch of salt.

Wheat Muffins.—One pint sour milk, one-fourth teaspoonful soda, one and one-half teaspoonfuls baking powder, one-half teaspoonful salt, one teaspoonful sugar, one tablespoonful butter, one beaten egg, flour enough to make stiff as cake batter. Grease muffin tins; fill half full, and bake in a quick oven. Sweet milk without the soda may be used. Add an extra teaspoonful of baking powder.

Breakfast Gems.—One heaping pint flour, one teaspoonful baking powder, one teaspoonful salt, butter half size of an egg, one teacupful water. Bake fifteen minutes.

Graham Gems.—One cupful sour milk, one-half teaspoonful soda, one tablespoonful sugar, pinch of salt; add Graham flour to make stiff batter. Drop in greased gem pans and bake quickly. This amount makes eight gems.

Waffles.—Mix one quart each milk and flour, five tablespoonfuls yeast, and a teaspoonful of salt. Set this over night as a sponge. In the morning add two eggs and a tablespoonful of melted butter, and bake in waffle-irons.

Rice and Corn Meal Waffles.—Mix a cupful cold-boiled rice, half cupful each flour and corn meal, two well-beaten eggs and milk to make soft batter. Add a tablespoonful melted butter, one and one-half teaspoonfuls baking powder, and a teaspoonful of salt. Beat smooth and bake in waffle-irons, greasing your irons.

Griddle Cakes.

Take one cupful flour, two teaspoonfuls baking powder, and a sprinkle of salt. Sift the dry ingredients together into a bowl. Beat an egg, add a scant cupful of milk, and stir in gradually the dry ingredients, to make a smooth batter. Place an iron or soapstone griddle over the fire and grease it with a little dripping. When the fat begins to smoke, dip out the batter with a tablespoon or ladle and pour it on the griddle to form cakes. When the cakes are full of bubbles, turn them so that both sides may be brown. Serve on hot plates, with syrup, or butter and sugar, or place them in layers, with butter, sugar and cinnamon between.

The cakes may be varied by adding half-cupful of cold boiled rice, hominy, wheatena, oatmeal or canned corn, to the ingredients called for. By using a half cupful of corn meal, rye, Graham flour or bread crumbs, instead of the flour called for in the recipe, various kinds of griddle cakes may be made.

Buckwheat Cakes.—Take a quart of buckwheat flour, a teaspoonful of salt, a handful of Indian meal, two tablespoonfuls of molasses. Add four tablespoonfuls of yeast and enough warm water to make a thin batter. Beat well and set to rise in a warm place. Let rise till morning and bake quickly on a hot iron.

Breakfast Cakes.—Take one quart bread crumbs; pour enough boiling water over to soak them. Add quart buttermilk, three eggs, one-half teaspoonful salt, tablespoonful of lard, teaspoonful soda. Stir well and thicken with flour to the right thickness for griddle cakes.

Fritter Batter.—Beat the yolk and the white of one egg separately. To the yolk add a tablespoonful of butter and a little salt, and two tablespoonfuls water or milk, and stir in flour to make a smooth dough. Add as much more of the liquid gradually to make a batter, and beat in the stiff white of the egg. Fry in deep, hot fat. The fritters may be served with syrup, with sugar and cinnamon, or with a pudding sauce.

To make apple fritters, add one tablespoonful of sugar to the batter. Cut apples into slices, dip in the batter and fry them. Sprinkle them with sugar and cinnamon before serving. Oysters and clams may be dipped in the fritter batter for frying.

Cereals.

In cooking cereals use plenty of water. Be careful to cook cereals thoroughly. Cereals should be cooked in a double boiler, to prevent scorching.

Avena or Rolled Oats.—Put one and one-half cups of boiling salted water into the top of a double boiler. Remove any black specks found in the oatmeal, and stir one-half cup of the meal into the water. Cover and cook from thirty minutes to one hour. Serve with milk or cream and sugar. Baked or steamed apples and other fruits are sometimes served with oatmeal.

Scotch Oatmeal.—Pick over a cup of coarse oatmeal and put it, with one teaspoonful salt and five cups boiling water, into a two-quart covered boiler or pail. Set it on a stand in large kettle of boiling water and let it boil slowly all day or all night. This makes a jelly-like mass with a rich flavor. Do not stir, as stirring makes it ropy.

Wheatlet.—Pick over the wheat. Put it, with salt and six cups boiling water, into the top of a double boiler. It may cook from thirty minutes to two hours.

Cornmeal Mush.—Add salt to a cup of cornmeal and mix one cup cold water gradually to make a smooth paste. Pour it into a pint of boiling water and cook in a double boiler from three to five hours. Serve with milk or cream.

Cold mush may be cut in slices one-half inch thick and fried a delicate brown. Serve with syrup.

Rice.—Take one-half cup of rice and pick out the specks. Wash and rub it with the hands in two or three waters to make it white. Then dry it in a clean cloth. Put it, with one and one-quarter cups boiling water and salt, into the top of a double boiler and cook from thirty minutes to one hour, until perfectly soft. If it becomes dry in cooking, add one tablespoonful hot water occasionally. A few raisins, seeded and cut into small pieces, may be cooked with the rice to flavor it. If the rice is cooked in milk instead of water, one and one-half cups hot milk to one-half cup rice will be a good proportion. When the rice is done, press it into small cups, let it cool two or three minutes, and turn the shapes out on a pretty dish. Serve hot with sugar and milk.

Boiled Hominy.—Soak over night; put in pot with two quarts water to a quart of hominy; boil slowly for three hours, or till soft. Drain in a colander, and stir in butter, pepper, and salt. There are two grades of hominy, the large and the small grained. The latter may be boiled till as thick as mush, and eaten as a breakfast dish with sugar and cream.

Fried Hominy.—Cut into slices cold boiled hominy, and fry in hot lard, or moisten with milk to a soft paste; add melted butter, and a beaten egg, and form into round cakes. Dredge with flour and fry a light brown.

Cakes and Cake-Making.

General Directions for Making Cakes.—For cakes which contain butter, cream the butter, warm slightly if hard, add sugar gradually, and beat. When smooth add the yolks of eggs or whole eggs (beaten light) and the milk. Then sift in the flour, which has been mixed with the baking powder and spices. When the yolks and whites are beaten separately, the whites are usually added last.

A cake can be made fine-grained by long beating; light and delicate with a small amount of beating. Never stir cake after the final beating. For cakes which do not contain butter, separate the whites and yolks of eggs. Beat the yolks until thick, add sugar gradually, and continue beating; add flavoring. Beat whites until stiff and dry and add to mixture.

Sift the flour with the salt and cut and fold in lightly at the last. Do not beat mixture after flour is added, if baking powder is not used.

Light Cake.—Cream one cup of butter, and work in gradually one and one-half cups of sugar. Separate three eggs, beat the yolks, pour in one-half cup of milk, and add to the creamed butter. Sift with three cups of flour two teaspoonfuls baking powder and add to mixture. Beat well to make a smooth batter. Beat the whites until stiff and fold lightly into the batter. One cup

SPECIAL DECORATIONS

The table is prepared for a special occasion and profusely decorated with flags—potted plants and vines. This answers for all Patriotic occasions. At the right is a beautiful window box and hanging basket.

TABLE DECORATIONS.

A happy suggestion for the arrangement and decoration of a dinner-table for a special occasion, such as a wedding dinner. The contrast of light draperies on the walls and the green of the plants is very

currants or nuts, well flavored, may be added. Bake in round, shallow pans; put the cakes together with jelly between.

Sponge Cake.—Three eggs, one and one-half cups flour, one and one-half cups sugar, two teaspoonfuls baking powder, two teaspoonfuls vanilla or lemon, one-half cup boiling water. Beat the whites and yolks separately until light, then put together and beat again, sift in sugar, a little at a time, add flavoring, flour and baking powder, beat all together, last stir in hot water, bake in two layers, and ice.

Pound Cake.—Take one pound each of flour, sugar, and eggs, three-quarters pound of butter, one nutmeg, one teaspoonful of mace. Cream half the flour with the butter, add spice. Beat the yolks of the eggs and add the sugar, then add the beaten whites and the remaining flour. When this is done mix all thoroughly, beating for half an hour. This, if properly baked, makes an excellent cake.

Gold Cake.—Take one-half pound of pulverized sugar, one-quarter pound of butter, one half pound of flour, one-half cup of milk, the yolks of six eggs, a half teaspoonful of soda and one of cream of tartar, and the rind of one lemon. Mix thoroughly.

Silver Cake.—Take same materials as above, except that the whites, instead of the yolks, of six eggs are used. Mix the soda and cream of tartar with the flour. Flavor with oil of bitter almonds instead of lemon rind. Bake gold and silver cake in tins of same size, and lay in alternate slices in the cake basket.

Angel Food Cake.—Whites of eleven eggs, one and one-eighth cups of sifted granulated sugar, one cup sifted flour, one teaspoonful vanilla, or almond flavoring, one teaspoonful of cream tartar, sift flour and cream tartar together several times; beat eggs to a stiff froth on a platter, add the sugar lightly, then the flour gently, then the flavoring. Do not stop a moment before putting it in pan. Bake in a moderate oven forty minutes. Do not grease pan, but put several layers of paper in the bottom. When done invert pan and do not take out until cool. Use plain white icing.

Lemon Cake.—Two cups sugar, one cup butter, one cup sweet milk, three cups flour, whites of four eggs, one lemon, grated rind and juice, three teaspoonfuls baking powder; beat the eggs to a stiff froth and add after the batter has been mixed; bake in jelly pans, put icing between.

Lemon Jelly Cake.—One and one-half cups sugar, one-half cup butter, beat to a cream, one-half cup milk, two and one-half cups flour, two teaspoonfuls baking powder, three eggs, well beaten, bake in layers. Jelly: One cup sugar, one egg, the juice and grated rind of one lemon, one tablespoonful water, one teaspoonful flour, place dish in a pan of boiling water and let thicken, when cool spread between layers.

Mountain Cake.—Two cups sugar, one-half cup butter, two eggs beaten together until light, three cups flour, one cup sweet milk, two teaspoonfuls baking powder, bake in layers. Icing: White of one egg, beaten stiff, seven teaspoonfuls pulverized sugar.

White Mountian Cake.—One cup sugar, one-half cup butter, one-half cup sweet milk, one-half cup corn starch, one cup flour, whites of six eggs, half teaspoonful vanilla, two teaspoonfuls baking powder. Bake in layers. Icing: Whites of two eggs, twenty teaspoonfuls sifted sugar, beaten very light, half teaspoonful vanilla. Spread between layers on the outside.

Chocolate Cake.—One-fourth cake of chocolate, one-fourth cup sweet milk, one-half cup sugar; cook this together, and when hot add the beaten yolks of two eggs. Flavor with vanilla, and set aside to cool. Take one egg, one-half cup sugar, one-half cup butter, one-half cup sweet milk, one and a half cups flour, one-half teaspoonful soda dissolved in the milk; when the other mixture is cool stir the two together. Bake in layers, and put cooked icing between.

Marble Chocolate Cake.—Two cups sugar, three fourths cup butter, three cups flour, one cup milk, four well-beaten eggs, two teaspoonfuls baking powder. Take one cup of this batter and mix with four tablespoonfuls of chocolate, dissolved in a little cream. Cover the bottom of the pan with white batter, and drop a spoonful of the

chocolate mixture upon it in places, which will form rings; then another layer of white and dark until all is used. Bake in a moderate oven.

Cocoanut Cake.—Two cups sifted granulated sugar, three-fourths cup butter, beaten to a cream, one cup sweet milk, whites of seven eggs, two heaping cups flour, one and one-half teaspoonfuls baking powder, one cup corn starch. Filling: Two cups sugar, one-half cup cold water. Boil together and stir into the well-beaten whites of the eggs. Beat until cold, then spread on each layer, and sprinkle each with grated cocoanut.

Cream Cake.—One cup sugar, one and one-half cups flour, two teaspoonfuls baking powder. Beat two eggs until very light, put in cup and fill up with cream. Bake in layers in a quick oven. Filling: One-half cup sugar, one egg, one tablespoonful flour, one pint milk, small tablespoonful butter. Boil gently for a few minutes, flavor after removing from the stove.

Ice Cream Cake.—One cup butter, beaten to a cream, two cups pulverized sugar. Mix sugar and butter and beat until light, add one cup sweet milk, three full cups flour, and three teaspoonfuls baking powder; lastly add the whites of eight eggs, well beaten. Bake in layers.

Almond Cake.—Whites of five eggs, two coffee-cups "A" sugar, one cup sweet milk, two-thirds cup of butter, three cups flour, two teaspoonfuls baking powder, one teaspoonful lemon extract. Cream, butter and sugar together, add milk, flour, well-beaten whites of eggs, then the baking powder. Bake in three layers. Filling: White of one egg beaten stiff, one cup of sugar, one-fourth cup water. Boil water and sugar until it is brittle, when drop in cold water. Pour over the egg and beat well, add one-half pound of blanched and chopped almonds, flavored if desired. Then spread between layers.

Fruit Cake.—Four eggs, one cup sugar, two cups molasses, one and one-half cups butter, one-half cup milk, one teaspoonful soda, one pound of raisins, one pound of currants, one-half pound of citron, sliced fine, one teaspoonful cinnamon, one nutmeg, one teaspoonful cloves, five cups flour. Bake two and one-half hours, in a slow oven.

Fruit Cake.—One pound sugar, one pound butter, one pound flour, ten eggs, one pound raisins, one-half pound currants, one-fourth pound citron, one nutmeg, one tablespoonful cinnamon, one tablespoonful ginger and allspice mixed, one tablespoonful vinegar, one teaspoonful soda. Bake slowly.

Boiled Frosting.—Take one cup granulated sugar, one-half cup water, one-eighth teaspoonful cream of tartar, mix together and cook without stirring until the liquid, when dropped from a spoon, will thread. Beat the whites of two eggs. Remove the mixture from the fire, and when cool pour it slowly upon the whites of eggs, beating all the while. Continue beating until the mixture is a thick, creamy mass; then spread it over the cake.

Egg Frosting.—Beat the white of an egg until light. Then beat into it, gradually, enough powdered sugar to make a soft dough. Add one-quarter teaspoonful lemon extract, or one teaspoonful lemon or orange juice, or one-quarter teaspoonful vanilla, and spread it on the cake.

One tablespoonful melted chocolate, or one tablespoonful desiccated cocoanut may be mixed with it. The yolk of the egg may be used instead of the white to make Sunshine Frosting.

Plain Frosting.—Mix one cup sugar and a tablespoonful lemon or orange juice; stir in enough boiling milk or water to make a soft dough. Spread it over the cake. This may be varied by adding different ingredients as in the preceding recipes.

Chocolate Filling.—Beat together the yolks of two eggs, one-half cup cream, one-half cup sugar, two sections of a cake of chocolate; put in saucepan and boil until thick enough to spread.

Cream Filling.—One pint of sweet cream beaten until it looks like ice-cream; add one cup sugar, flavor with vanilla; blanch and chop one pound of almonds, stir in cream and spread very thick between layers.

Soft Gingerbread.—One-half cup of lard, one cup each of milk and sugar, two

of molasses, one teaspoonful soda, two tablespoonfuls cinnamon, and one of ginger. Stir butter, sugar, molasses and spice together, add the milk and soda, and, lastly, about five cups of flour. Beat hard, and bake into a loaf, or in small tins. Some seeded raisins will improve. Add these last.

Ginger Crackers.—Take one pint molasses, one cup of shortening, and one of sugar, with ginger and cinnamon to taste. Add flour enough to make a soft dough. Roll very thin, cut into small cakes, and bake in a quick oven. For plain cookies use only one-half cup shortening.

Ginger Snaps.—One cup each of sugar, molasses and lard, one egg, one tablespoonful ginger, one tablespoonful vinegar, dissolving in the vinegar one teaspoonful soda. Use no milk or water. Mix in seven cups flour and knead. Roll out in any shape desired and bake in quick oven.

Risen Doughnuts.—Take a pint of boiling milk, two cups of sugar, one-half cup of butter, a half pint of yeast, and two eggs. Beat together the eggs, butter and sugar, and then pour in the milk. Let it rise three times, the last rising after they are cut out. Fry in smoking-hot lard. Sift with powdered sugar while hot.

Crullers.—Cream one tablespoonful of butter, work in a teaspoonful of cinnamon, beat the yolks and whites of two eggs separately, then together, and stir into the batter. Sift two-thirds cup sugar and one teaspoonful baking powder with two cups flour, add to the eggs and butter, mix well, and stir in gradually one-quarter to one-half cup milk. Roll out, cut in rounds, with a small round out of the centre of each; fry in deep, hot fat, turning as the sides are browned. Lift from the fat with a wire frying-spoon, and lay on brown paper to drain.

Jumbles.—Mix one pound each flour and granulated sugar and one grated nutmeg. Put in one pound butter, and stir in two beaten eggs. Sift granulated sugar on a board, lay the dough on it, roll out one-third inch thick, cut out with a round cutter, and cut out a circle in the centre. Bake in a buttered pan, in a moderately hot oven, from ten to twenty minutes.

Cocoanut Jumbles.—Grate one cocoanut. Rub one-half pound butter and sifted sugar together. Mix with one pound of sifted flour and three well-beaten eggs, with a little rose water. Mix the cocoanut gradually, so as to make a stiff dough. Bake in a quick oven, placing the batter in small particles in tin pans, or on greased paper.

Sugar Cookies.—Cream one cup sugar and one-half cup butter, beat one egg and add it with one-quarter cup milk. Sift in one teaspoonful baking powder with one cup of flour. Flavor with one-quarter teaspoonful lemon or vanilla. Stir in more flour to make a dough stiff enough to handle. Roll out on a floured board until one-quarter inch thick. Bake from ten to fifteen minutes.

Lemon Crackers.—Two and one-half cups soft sugar, one cup lard, one pint sweet milk, two eggs, five cents' worth baking ammonia, two cents' worth lemon oil. Dissolve ammonia in the milk, or in a little hot water, make dough as stiff as for pies, and roll very thin, cut with square cake cutter, prick with fork, and bake in hot oven.

Cracknells.—To one pint rich milk add two ounces butter and one tablespoonful yeast, make it warm, and mix enough flour to make a light dough. Roll thin and cut in any shape desired, prick well with fork, and bake in slow oven, allowing to rise as they bake.

Chocolate Drops.—One-half cake grated chocolate, one pound sugar, four eggs, one lemon, one tablespoonful baking powder, one tablespoonful cinnamon, flour enough to roll, cut out, place on greased pan and bake.

Swiss Puffs.—Two eggs, beat light, a pinch of salt in flour enough to make stiff dough, take out small bits, roll very thin and cut in strips, twist and join the ends together. Fry in hot lard, lift with fork, and let drain. Sprinkle with pulverized sugar.

Cream Puffs.—Melt one-half cup butter in one cup boiling water, stir in one cup flour, take off stove and beat thoroughly and let it cool. Stir in three eggs, one at a time without beating, mix thoroughly and drop a heaping teaspoonful in greased pans, two or three inches apart, and bake in a moderate

oven twenty-five or thirty minutes, or until done; if not done they will fall. When cold cut open near the top and fill with custard cream. Cream: — Two-thirds pint sweet milk, four tablespoonfuls sugar, one egg, two tablespoonfuls flour, wet in a little milk. Mix all together and boil until it thickens, add one teaspoonful vanilla, and let cool a little, then fill puffs.

Hickorynut Snaps.—Three cups chopped nuts, one pound sugar, one teaspoonful cinnamon, three eggs, one tablespoonful baking powder, two cups flour. Mix well, drop from teaspoon on greased pan, and bake a light brown.

Tea Cake.—Two well-beaten eggs, two cups sugar, two-thirds cup butter, one teaspoonful flavoring, five pints flour, with two heaping teaspoonfuls baking powder, mixed into it. Mix thoroughly and add one-half cup sweet milk, or one cup sour cream, beaten to a foam with soda. Take upon the bread board and mix stiff. Bake in hot oven.

Custards and Creams.

Cup Custard.—Scald one pint milk. Beat two eggs, add the milk, sprinkle of salt and two tablespoonfuls sugar, and stir until the sugar dissolves. If desired, a little nutmeg may be added. Pour into cups, stand the cups in a pan of boiling water, put the pan in the oven and bake until the custards are firm in the centre.

To make a bread-and-butter pudding, pour the custard into a pudding-dish and place buttered slices of bread on top of the custard. Stand the pudding-dish in a pan of boiling water and bake in the oven.

To test baked custard. Put a knife in the centre; if it comes out without egg or milk on it the custard is cooked. Overcooking will curdle it.

Steamed Custard. — Scald one pint milk. Mix one teaspoonful cocoa with a little cold milk and stir into the hot milk. Boil one minute. Separate two eggs, keeping the whites in a cool place. Beat the two yolks and one whole egg together, add salt and three tablespoonfuls sugar, and stir into the hot milk. If liquid flavoring, instead of cocoa, is used, add it last, and pour the mixture into a pudding-dish or into cups. Set it into a pan of hot water or into a steamer over a kettle of boiling water until the custard is solid. Just before meal time beat the two whites of eggs stiff, add half tablespoonful sugar and half tablespoonful red jelly or jam, and drop by spoonfuls on the custard for a meringue or float.

Snow Custard.—Take one quart of milk, sweeten and flavor with lemon and vanilla. Bring the milk to a boil, and lay on top the whites of five eggs beaten to a froth. When the whites have cooked slightly, remove and lay on a dish. Then add the boiling milk to the beaten yolks, stirring constantly, and put on the fire until near boiling. Then remove it, and lay the whites carefully on top.

Floating Island.—Scald one pint milk. Separate three eggs. Add salt and two tablespoonfuls sugar to the yolk and beat. Beat the whites until very stiff, add one teaspoonful powdered sugar to them, beat slightly, and drop spoonfuls of the stiff whites on top of the scalded milk. Let them cook two or three minutes, until firm, lift out on a plate, and pour the scalded milk on the beaten yolks. Put this mixture into a double boiler, and stir until it thickens. Pour it into a china or glass dish. When nearly cool, stir in the flavoring, put the whites on the top, and serve cold, as a pudding. A pretty way to serve it is to put specks of jelly on the tops of the whites.

To make cocoanut or chocolate custard, cook two tablespoonfuls cocoanut or one-half tablespoonful melted chocolate in the scalded milk.

Tapioca Custard.—Soak three heaping teaspoonfuls of tapioca over night. Place over fire one quart milk, let come to a boil, then stir in tapioca, pinch of salt; one cup sugar and beaten yolks of three eggs. Stir quickly and place in dish. Place on top the whites of three eggs well beaten. Set on ice.

Small Custard.—Beat one egg, one heaping teaspoonful sugar; one-half pint milk. Put in cup, set in vessel of boiling water and bake.

Baked Custard. — Four well-beaten eggs, one-half cup of sugar, one and one-half pints milk; flavor with nutmeg. Bake from three-quarters of an hour to an hour, according to temperature of oven. If baked too long it will be watery. As soon as it solid clear through it is done. Set baking-dish in a pan of water while baking.

Peach Cream.—To one quart of ripe peaches, peeled and rubbed through sieve, add whites of two eggs, one cup granulated sugar. Beat together until a stiff cream is formed. Serve cold.

Banana Cream.—After peeling the bananas, mash fine with a spoon, then allow equal parts of bananas and sweet cream. To one quart of the mixture add one-fourth pound sugar. Beat all together until the cream is light.

Spanish Cream.—Scald three cups milk with one-quarter box gelatine, add one-half cup sugar, and pour on yolks of three eggs slightly beaten. Cook until thick, stirring constantly; remove from heat, add salt, one teaspoonful vanilla, and whites of eggs beaten stiff. Pour into mold wet with cold water.

Apple Snow.—Peel and grate one large sour apple, sprinkling over it a small cup of powdered sugar as you grate it, to keep it from turning dark; break into this the whites of two eggs, and beat it all constantly for half an hour; take care to have it in a large vessel, as it beats up very stiff and light; heap in a glass dish and pour a fine, smooth custard around it and serve. A very delicate dessert.

Raspberry Float.—Crush one pint ripe red raspberries with gill of sugar. Beat whites of four eggs to stiff froth and add gradually a gill of powdered sugar. Press raspberries through fine strainer to remove seeds, and by degrees beat in juice, egg and sugar until so stiff that it will stand in pyramids.

Lemon Jelly.—Take one ounce gelatine, cover with one pint cold water, let stand for one hour. Add one pint of hot water and juice of three lemons; sweeten to taste and let boil; strain and set away to cool.

For orange jelly, omit the lemon juice, slice four oranges, and place in a glass jar. Pour gelatine over and eat cold.

Strawberry Charlotte.—Make boiled custard of one quart of milk, yolks of three eggs, three-fourths cup sugar. Place in fruit dish, pieces of cake dipped in sweet cream, lay upon this ripe strawberries sweetened to taste, and alternate layers of cake and berries. When the custard is cold pour over it cake and berries. Beat whites of eggs to stiff froth, add three tablespoonfuls of sugar and place on top of custard.

Tapioca Cream.—Soak over night two tablespoonfuls tapioca in one-half teacup milk (or enough to cover), bring one quart milk to boiling point. Beat well together the yolks of three eggs, one-half cup sugar, one teaspoonful vanilla or lemon for flavoring. Add tapioca and stir the whole into boiling milk, let boil, turn into dish, and immediately turn on the well-beaten whites. Serve cold.

Puddings and Sauces.

Cabinet Pudding.—Cream together a quarter pound butter and a pound and a half of sugar. Add the beaten yolks of five eggs, and a half pound of flour moistened with a cup of milk, alternately with the whites. Add lastly a half pound seeded and cut raisins, a quarter pound currants, and the juice and grated rind of half a lemon, well dredged with flour. Cook for two and a half hours in a buttered mold. Serve hot with cabinet-pudding sauce.

This sauce is made as follows: Rub together a cup of sugar and a tablespoonful of butter, add the well-beaten yolks of four eggs, the juice and half the grated peel of a lemon, and a teaspoonful of cinnamon. Beat ten minutes, add a glass of wine, and stir hard. Set in boiling water and beat while heating, but do not let it boil.

Cottage Pudding.—Rub together a cup of sugar and a tablespoonful of butter. Beat in the yolks of two eggs, then add a cup of milk, a teaspoonful of salt, half one of soda, and the beaten whites, and enough of flour to make a moderately thick batter.

To the flour add a teaspoonful of cream of tartar. Bake in a buttered mold, cut in slices, and eat with sauce.

Bread Crumb Pudding.—Take one cup bread crumbs and half cup sugar, put them into a pint of scalded milk, add two tablespoonfuls butter, the rind and half the juice of a lemon. Beat the yolks of two eggs and stir the mixture into them. Bake in a buttered dish about thirty minutes, or until thick and brown. Cool and spread a meringue of the beaten whites, half cup pulverized sugar and the remainder of the lemon juice on the top. Brown in the oven and serve hot or cold.

Bread-and-Butter Pudding.—Cut thin slices of stale bread, butter thickly and sprinkle with sugar. Fit neatly into a buttered pudding dish until half full. Lay on top a plate to keep them from floating, and pour in a custard made of three cups of hot milk, four beaten eggs, and nearly a cup of sugar. Season with vanilla and nutmeg. Let soak for fifteen minutes, then remove the plate and put in the oven. If the bread still inclines to float, hold it down with a fork until the custard thickens. Eat cold. Layers of currants improve this.

Rice Pudding.—Wash a cup of rice and soak for two hours in a pint of milk. Then add three pints of milk, a spoonful of salt, butter of the size of an egg melted, and flavor with nutmeg and cinnamon. Bake two hours.

Bag Pudding.—Take one cup each of milk, syrup molasses, and finely chopped suet, half a pound of currants, and three cups of flour. Mix thoroughly, add a teaspoonful each, of soda and ginger. Pour into your pudding-bag, tie closely, and boil for two hours.

Tapioca Pudding.—Add to three pints of milk eight large tablespoonfuls tapioca. Warm, and let soak until soft. Then stir, and mix in two teaspoonfuls melted butter, four beaten eggs, four spoonfuls sugar, one glass wine, a grated nutmeg and the rind of a lemon. Bake immediately.

Block Pudding.—Take three cups flour, one cup each of molasses, sweet milk, and finely chopped suet, a teaspoonful each of cloves, cinnamon, and nutmeg, and a half pound of raisins. Stir well together, boil for four hours, and serve with sauce.

Baked Indian Pudding.—Mix together half cup corn meal, quarter cup flour, one egg, quarter cup New Orleans molasses, with a little salt, ginger and cinnamon. Stir these into three cups of hot milk. Bake in a moderate oven. When the top begins to brown pour a little cold milk over it and cover it. Bake four to five hours, putting cold milk on the top every hour. Serve with hard sauce or with cream and sugar.

Suet Pudding.—Three cups flour, one cup chopped suet, one heaping cup chopped raisins, one teaspoonful salt, two teaspoonfuls baking powder; mix one cup flour while chopping raisins, then suet and baking powder, then the other cup flour, water enough to finish mixing; put in a sack, boil two or three hours. Sauce:—Tablespoonful flour, butter size of one-half egg, one-half teacup sugar, nutmeg and vinegar to taste, one pint of water, boil all together.

Batter Pudding.—One pint milk, four tablespoonfuls flour, pinch of salt. Scald the milk, taking out some to smooth the flour, then stir into the milk until it thickens and stand away to cool. At noon beat the yolks of five eggs and stir in, then the whites well beaten and bake twenty or thirty minutes. Serve while hot. Sauce:—Cream, one cup sugar, one tablespoonful butter, add flavoring and one-half pint of whipped cream.

Chocolate Pudding.—One quart sweet milk, one small cup of sugar, two well-beaten eggs, six tablespoonfuls grated chocolate, two heaping tablespoonfuls corn starch, dissolved in a little cold milk, a small piece of butter. Let boil a few minutes, stirring constantly. To be served with whipped cream, or sugar and cream.

Cottage Pudding.—One cup milk, one-half cup sugar, one egg, two tablespoonfuls melted butter, one teaspoonful baking powder, sifted with one pint of flour. Bake half hour and serve with liquid sauce. Sauce:—Two tablespoonfuls flour, one cup sugar, teaspoonful vanilla, tablespoonful of

butter; mix these with one tablespoonful of cold water, put in sauce-pan and pour slowly in a little less than a pint of boiling water.

New Century Pudding.—Take one cup each of suet, sugar, currants, raisins and milk, add three cups of flour. Shred and chop fine the suet and prepare the fruit. Beat together until light the suet and sugar and the yolks of two eggs; add the milk and flour; beat until smooth; add the beaten whites of the eggs, a teaspoonful each cinnamon and a little salt, and a teaspoonful baking powder. Mix well, flour the fruit and add; turn into a greased mold and boil for three hours. Serve hot, with wine or hard sauce.

Cream Pudding.—Stir together one pint of cream, three ounces sugar, yolks of three eggs, a little grated nutmeg, add the well-beaten whites, stirring lightly, pour into a buttered pie plate on which has been sprinkled crumbs of stale bread to the thickness of an ordinary crust, sprinkle over the top a layer of breadcrumbs and bake.

Cocoanut Pudding.—One pint sweet milk, one-half cup sugar; let milk come to boil (in custard kettle), add sugar, four tablespoonfuls of corn starch dissolved in cold milk, two cups grated cocoanut (less will do), stir well, cook until it thickens, remove from fire, gently beat in the whites of four eggs well beaten, one-fourth teaspoonful of lemon and vanilla each. Pour in molds and serve with whipped cream when cold, or pour half in mold, add a few drops of red fruit coloring to the remaining half and pour on top, or flavor part with two spoonfuls of melted chocolate.

Cup Pudding.—Make a batter as for waffles; to one pint of milk allow two eggs and enough flour to thicken, one teaspoonful baking powder, stirred in the flour. Butter a sufficient number of teacups and fill with this and fruits in layers. Set cups in a steamer, boil water underneath for one hour. Serve while hot with sugar and cream. Any jam or raw apples chopped fine is nice with this.

Lemon Pudding.—The juice and grated rind of one lemon, one cup sugar, yolks of two eggs, three tablespoonfuls corn starch, a pinch of salt, one pint sweet milk; mix corn starch and part of milk to a smooth paste, add lemon and sugar, egg well beaten and the rest of the milk. Line a jelly tin with a rich puff paste one-fourth inch thick, pour custard in, and bake until done; beat whites to a stiff froth, with two tablespoonfuls of sugar, spread over the top, return to oven and brown; serve with whipped cream. This is a rich but not expensive pudding.

Brown Betty.—Chop two cups of tart apples; put a layer into a deep dish, buttered; sprinkle with sugar, and a little butter and cinnamon; cover with breadcrumbs, and add more apple. Continue till the dish is full, add a thick layer of crumbs, cover closely, and steam for nearly an hour in a slow oven. Then uncover and brown quickly. Eat warm with sweet sauce, or sugar and cream.

Cherry Roll.—Seed one quart fruit, sweeten to taste, let it simmer in its own juice until quite thick, pour one quart of milk over a loaf of grated bread, beat three eggs very light, and add the milk, with a little flour and large lump of butter melted. Put the cherries inside the batter and stir well. Steam in cups or baking powder cans two hours.

Apple Roll.—One pint flour, one and one-half tablespoonfuls butter, pinch of salt, add water to make a soft dough, roll one-half inch thick; chop two large apples fine, spread over the cake, roll up, fasten, place in pan to bake. Pour over this one and one-half pints of boiling water, one cup sugar, one-half cup butter. Cover pan, bake one hour, basting often with sauce. For small family use one-half of recipe.

Apple Tapioca.—Pick over and wash three-quarters cup tapioca or sago and soak about one hour. Pour on a quart of hot water, cook till clear; stir often, add salt. Prepare and core six apples, slice or put them whole into a buttered baking-dish, sprinkle sugar and spice over them, and turn in the tapioca. Bake till the apples are soft; flavor with cinnamon and nutmeg. Serve with cream or milk and sugar. Peaches may be used instead of apples.

Pudding Sauce.—One cup boiling water, one tablespoonful corn starch, one-fourth cup butter, one cup sugar, one egg, one-fourth nutmeg, one or two tablespoonfuls of jelly. Wet the corn starch in cold water, stir into boiling water, boil ten minutes. Rub butter and sugar to a cream, add the egg well beaten and nutmeg. Add jelly to the corn starch, and pour this in the egg mixture, and stir rapidly until they are thoroughly blended.

Lemon Sauce.—Mix one-half cup sugar and one tablespoonful corn starch; add slowly one cup boiling water, stirring carefully; boil until transparent; remove from fire. Add four tablespoonfuls of butter, two tablespoonfuls of lemon juice, and a little nutmeg.

Cold Cream Sauce.—Beat together one cup sugar and one half cup butter, and add a cup rich cream. Stir all to a cream; flavor with vanilla or lemon, and let get very cold before serving.

Plain Cream Sauce.—One pint cream, three ounces brown sugar, and half of a small nutmeg grated.

Hard Sauce.—Cream one-half cup butter, work in one cup pulverized sugar gradually, and add two tablespoonfuls lemon juice or one tablespoonful lemon juice and one tablespoonful vanilla. Beat until foamy. Serve with hot pudding.

Pies and Pastry.

Pie-Crust.—One cup shortening, three cups flour; little salt, rub the flour, shortening and salt all well together. Use enough cold water to hold all together, no more. Handle as little as possible. Crust for one pie:—One coffee cup flour, lard size of an egg, one fourth teaspoonful salt, water just to wet the other ingredients.

Puff Paste.—Take a pound of flour and three-quarters of a pound of butter. Chop half the butter into the flour. Beat the yolk of an egg, stir it into half a cup of ice water, and with this work the flour into a stiff dough. Roll out thin, add in bits one-third the remaining butter; fold, and roll out again, and continue till all the butter is used. Roll very thin, fold, and set in an ice-cold place for a quarter hour. Then make your crust. This paste will serve both for fruit pies and for oyster patés.

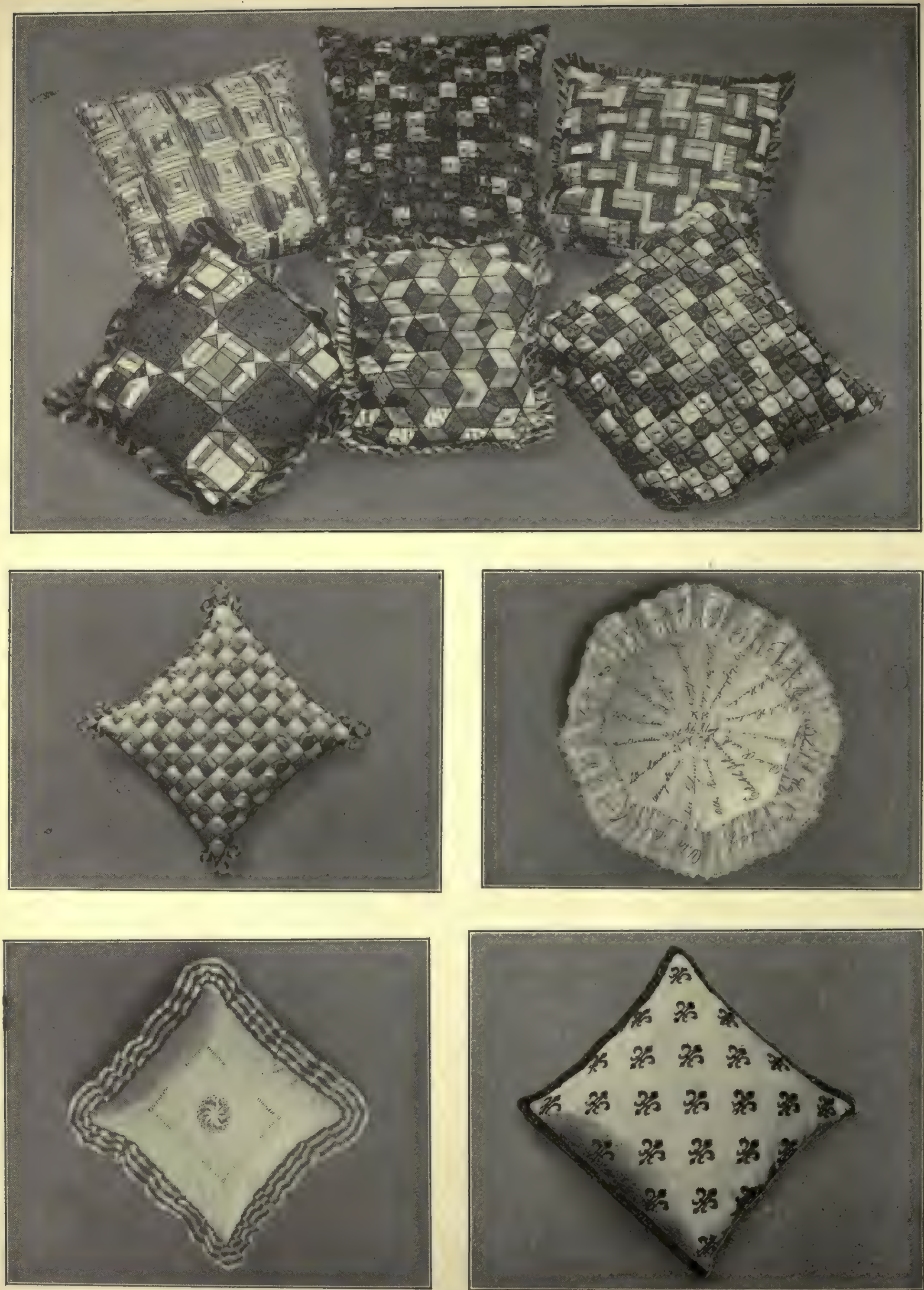
Short-Cake Paste.—Sift together two cups flour, half teaspoonful cream of tartar, and quarter teaspoonful each soda and salt, and rub in half cup of butter, keeping it as cold as possible. Stir in one cup of sweet milk to make a dough soft enough to handle. Turn it on a floured board; divide the dough into halves and roll each piece out to fit a round tin plate. Bake at once, in a hot oven. When done, turn out each cake and lay it on the under side of the baking-tin. With a thin, sharp knife, split the cake evenly, and lay the bottom crust on a china plate. Butter each half. Lay partly mashed, sweetened strawberries, peaches, apple-sauce, stewed rhubarb, or any hot cooked fruit suitable for pies, on the under crust, lay the upper crust over it, and serve as a pie. Powdered sugar may be sifted over the top. Serve with cream.

Apple Pie.—Pare, core, and slice tart apples, put a layer of fruit in your crust, sprinkle thickly with light brown sugar, add more apples, and go on till thick enough. Cover with top crust and bake. Sift powdered sugar over the top.

Apple Custard Pie.—Take three cups stewed apples, which make very sweet with sugar, and let cool. Beat the yolks and whites of three eggs separately, and mix the yolks well with the apples, seasoning with nutmeg. Then stir in one quart of milk, beating as you do it. Lastly, add the whites, fill the crusts, and bake without top crust.

Pumpkin Pie.—Take a quart of stewed pumpkin, which has been pressed through a sieve; six eggs, yolks and whites beaten separately, two quarts milk, a cup or more of sugar, and mace, cinnamon and nutmeg for flavoring. Beat all well together, and bake without top crust.

Lemon Pie.—Take the juice and grated rind of one lemon, one cup of white sugar, the yolks of two eggs, three tablespoonfuls of sifted flour and sufficient milk to fill a plate. Bake without an upper crust. Bake till nearly done and then add a frosting made of



SOFA PILLOWS

Beautiful designs easily made. A group, each made of pieces of silk, ribbbon and velvet, cut in squares, diamonds and other shapes. Of the others, one is made of crimson denim with fleur-de-lis embroidered in dark blue silk; a second is of butchers' linen with square designs of drawn work in the centre; a third is in alternating squares of college colors; and the fourth is an octagonal pillow of white linen, the autographs are written in with pencil and outlined in silk.

the beaten whites of two eggs, and two tablespoonfuls of powdered sugar, and set back in the oven to brown slightly.

Cherry Pie.—Line the dish with crust; fill with ripe cherries, sugared in accordance with their degree of sweetness; cover and bake. Sift white sugar over the top. Fruit pies generally are made in the same way. They should be eaten cold.

Mince Pie.—Take four pounds of meat (boiled lean beef) and apple—two-thirds being apple. Add half a pound of suet. Chop each separately, and when fine mix thoroughly. Then put in three pounds of chopped raisins and two of carefully picked currants, a teaspoonful each of cinnamon, nutmeg, cloves, and half a spoonful of mace, with brown sugar to make very sweet. Add three quarts cider. Mix thoroughly, cover closely, and let stand for a day before using. This will keep all winter, and may be used as wanted. The flavor is much improved if it is allowed to stand a week or so. Add one pint of brandy if desired.

Cocoanut Pie.—One large cup of grated cocoanut, one quart of milk, the yolks of five eggs, a lump of butter the size of a hickorynut, sweeten to suit taste. Beat the whites of the eggs and spread over the pies after done, and return to oven and brown. This will make two pies.

Custard Pie.—One-half cup sugar, one quart rich milk, two tablespoonfuls corn starch, yolks of four eggs. Put on stove and stir until thick. Beat whites of four eggs to stiff froth, add two tablespoonfuls sugar, spread on top, and brown. This will make two pies.

Cream Pie.—One pint sweet milk, one egg beaten separately, one tablespoonful flour, two tablespoonfuls of sugar, lump of butter; flavor with lemon. Use white of egg for top. Cook in a kettle. Bake crust first. Put into crust, place white of egg on top. Place in oven to brown. This will make one pie.

Ice Cream Pie.—One pint of cream, whites of two eggs, half cup sugar, teaspoonful vanilla. Beat eggs to stiff froth, add other ingredients, bake with one crust.

Strawberry Pie.—Line a deep pie pan with rich crust, and bake. Fill with the following: Whites of two eggs, half cup of sugar, one pint of fresh berries. Beat the whites to a stiff froth, and stir in sugar and berries. Bake slowly fifteen minutes.

Pieplant Pie.—Mix half cup sugar with one heaping teaspoonful flour; sprinkle over the bottom crust, then add pieplant cut up fine; sprinkle over this another half teacup sugar and heaping teaspoonful flour; bake with upper crust fully three-quarters of an hour in slow oven.

Pineapple Pie.—Five eggs, one cup sugar, one-half cup butter, one cup sweet cream, one pineapple grated. Beat the butter and sugar to a cream, add the beaten yolks of the eggs, then the pineapple and cream, and lastly the beaten whites whipped in lightly. Take each section out with a steel fork and cut off the blossom, then chop them up very fine, and add the grated core or heart. Bake them with an under crust only.

Peach Pie.—Slice the peaches; line a pie plate with crust and lay in fruit, sprinkling with sugar. Ripe peaches need little. Add three chopped peach kernels to each pie; add a little water. Bake with an upper crust, or with cross-bars of crust.

Strawberry Short-Cake.—Take two cups flour, two teaspoonfuls baking powder, one-quarter teaspoonful salt. Sift into a bowl, rub in two tablespoonfuls butter, beat one egg, mix it with one cup of milk, and stir it gradually into the flour to make a smooth dough. Spread it in a greased pan, and bake in a quick oven twenty or thirty minutes. When done turn it on a hot plate, split open quickly and butter it. Spread strawberries over the lower half, sprinkle sugar over the berries, and replace the upper half; put another layer of strawberries and sugar on top. Serve cold or hot, with cream. Other berries, peaches or oranges may be used instead of the strawberries.

Apple Dumplings (Boiled).—Make your crust of a quart of flour and a quarter pound of suet, with a teaspoonful each of salt and cream-of-tartar and half one of soda. Make into a tolerably thick paste with cold water.

Roll, cut into squares, and put into each a pared and cored apple. The hole left by the core may be filled with marmalade, or with sugar moistened with lemon juice. Close the paste over your apple, tie the dumplings in cloths, and boil for an hour.

Apple Dumplings (Baked).—Into one quart flour drop two tablespoonfuls of lard (or lard and butter mixed) and add two teaspoonfuls cream-of-tartar. Then put in a teaspoonful of soda, and wet quickly with milk until stiff enough to roll into a paste half an inch thick. Cut into squares, lay in each a pared and cored tart apple, and close the paste around it. Lay in a buttered baking pan and bake till finely browned. Then brush with a beaten egg, and let glaze in the oven for a few minutes. Eat hot, with rich sweet sauce.

Jellies, Jams, Etc.

Apple Jelly.—Slice nice clean apples in preserving kettle with enough water to almost cover. When stewed soft, strain through the jelly bag. Measure juice and boil twenty minutes. Add two-thirds as much sugar as juice. Boil five or ten minutes longer. Always boil jelly as fast as possible.

Crab Apple Jelly.—Wash fruit clean, put in kettle, cover over with water and cook thoroughly. Pour into sieve and drain. Do not press it through. For each pint of juice allow one pound sugar. Boil twenty to thirty minutes.

Blackberry Jelly.—Wash berries and put in porcelain kettle with enough water to keep them from sticking. Cook a few minutes, then drain through jelly bag. To one pint of sugar add two pints of juice. Boil until it jellies.

Quince Jelly.—Wash, core and slice in small pieces. Stew in plenty of water until fruit is soft and juice is rich. Pour all juice off; for jelly use one pint of juice and one pint of sugar. Boil until it jellies.

Currant Jelly.—Wash the fruit in a stone jar, squeeze through a flannel bag, then strain without squeezing to obtain a clear liquid. Boil briskly in porcelain-lined kettle for twenty minutes, then stir in heated sugar; skim, boil two minutes longer; warm your tumblers and fill with the hot liquid; stand it away twenty-four hours to jelly. If not done then, cover the tumblers with window glass and let stand several days in the sun.

Grape Jelly.—Take grapes just turning ripe, wash, put in granite kettle with very little if any water, let simmer for one hour. Then mash, strain through flannel bag, let come to a boil. While this is heating put sugar in moderate oven. ("A" sugar is best.) For two cups juice take one cup of sugar; let boil for five minutes, then simmer ten minutes more. Strain again through another flannel bag into glasses. Do not make more than three glasses at once.

Calf's Foot Jelly.—Clean four calves' feet, put in a kettle of cold water and let simmer for eight hours; reducing from six to two quarts. Strain the liquid and let stand till next day. Next remove all fat from the surface and sediment from the bottom. Put in a kettle over the fire; add cinnamon and sugar, the juice of four lemons, two oranges, and the whites of two eggs slightly beaten. Mix well, boil hard for twenty minutes; throw in a gill of cold water, let boil again, then cover and stand at side of range for twenty minutes. Next pour into a flannel jelly bag, warmed, and let drip into a bowl. Do not squeeze or touch the bag. Turn into molds and stand in a cold place. If you desire, a half pint of sherry wine may be added before putting it into the molds.

Cider Apple Butter.—Boil one barrel of new cider down half, peel and core three bushels of good cooking apples. When cider has boiled to half the quantity add the apples and continue to cook.

Peach Butter.—Cook peaches until they will mash easily, run through a sieve: add pound for pound of sugar and peaches, stir until well cooked.

Tomato Butter.—Scald and remove skin from nice sized tomatoes, slice and mash fine, to each quart of tomatoes add a quart of granulated sugar; let cook fast, stir until done.

Lemon Butter.—Grate the rinds of three lemons, and add the juice. Beat

together two cups sugar and three eggs, and add one teaspoonful butter. Stir all together and boil to the consistency of strained honey.

Strawberry Jam.—Take a quart of berries, mash with a potato masher, add one pint granulated sugar, and cook fast, stirring constantly, until of the desired consistency.

Raspberry Jam.—To five pounds red berries add an equal quantity of granulated sugar. Mash the berries in a kettle, put in the sugar, let boil until it jellies upon a cold plate.

Pineapple Preserves.—Pare, slice pineapples; to every pound of fruit add one pound of sugar; place in jars a layer of apple, then of sugar; let stand over night; take juice off of the fruit and boil until it thickens; pour in the fruit and boil fifteen minutes; take apples out of syrup to cool; then put in jar and pour syrup over and seal.

Quince Marmalade.—Stew as many apples as you wish to put with your quinces, and strain the juice as for jelly. Pare and core the quinces, put in a bowl and chop as fine as desired; put in a vessel and cover with the apple juice, add a little water if necessary, and cook until the fruit is tender. Skim the fruit out carefully, strain and measure the juice; add sugar as for jelly, and boil until almost jellied. Drop in the fruit and cook until it begins to jelly. Put in jelly glasses.

Preserved Strawberries.—One large cup of sugar to one pint of berries. Add enough water to dissolve sugar, and boil to a thick syrup. Add berries, and boil rapidly fifteen minutes. Cook small quantity at a time.

Preserved Rhubarb.—Cut as for pies, without peeling; take the same quantity of sugar as you have fruit, put a small piece of butter in the bottom of a porcelain or granite kettle; place the sugar and rhubarb alternately in the kettle, place on the back of range and cook slowly, stirring occasionally, until sugar is dissolved; then cook more rapidly until preserved.

Preserved Peaches, Pears, Plums.—Make fruit ready for preserving; to each pound of fruit use three-fourths to one pound of sugar and one cup water, according to tartness of fruit, boil syrup from five to ten minutes, then put in fruit; boil until fruit looks clear; fill jars and close.

Spiced Currants.—Make a syrup of three pounds of sugar, one pint vinegar, two tablespoonfuls each of cinnamon and cloves, one-half teaspoonful salt; add six pounds of currants, and boil one-half hour.

Spiced Peaches, Pears, and Sweet Apples.—Take five pounds fruit, three pounds sugar, cloves and cinnamon to taste; one pint cider vinegar; have the syrup hot, cook until tender.

Canned Strawberries.—Wash berries thoroughly before picking off stems; weigh them. To each pound of berries allow one-quarter pound of sugar. Let them cook fifteen minutes; after they come to a boil they are ready to can.

Canned Peaches, Pears, and Quinces.—Prepare fruit for canning, place in kettle; to each quart of fruit put four tablespoonfuls of sugar; put in water to prevent burning, heat slowly to a boil, then boil three or four minutes, can and seal. Cook pears and quinces longer.

Canned Cling Peaches.—Take one quart of granulated sugar, one quart of water, let boil, add three quarts of nice smooth peaches, peeled; let boil slowly twenty minutes. This is sufficient for two quart cans. Have cans hot and dry; fill and seal while hot.

Canned Tomatoes.—Scald nice smooth tomatoes and cook in granite kettle; "simmer," not boil, ten minutes; salt, pepper as for use; then fill cans very full; just before sealing put in a lump of fresh butter the size of a walnut. Tomatoes canned this way will keep for years.

Canned Corn and Tomatoes.—Peel and slice tomatoes (not too ripe) in the proportion of one-third corn to two-thirds tomatoes; put on in porcelain or granite kettle; let boil fifteen minutes; can immediately in tin or glass. Some take equal parts of corn and tomatoes, and prepare as above.

Canned Rhubarb in Cold Water.—Cut rhubarb in small pieces as for pies without peeling; fill Mason jars with fruit; pump

water over it rapidly to force out all air. Put lids on tightly at once. Set in a dark, cool place.

Baked Apples.—Wipe and core sour apples. Place them in an earthen or agateware baking dish—never use tin for apples—and fill the centre of each apple with sugar. Measure one tablespoonful water for each apple, and pour it around the apples, being careful not to pour it through the centres, so as to take away the sugar. Bake until the apples are soft, from twenty to forty-five minutes. When done, place on an attractive dish. Strain the juice, measure, and put it into an agate saucepan. For each half cup of juice add one-third cup sugar. Boil five minutes, and pour it over the apples. Serve cold with milk or cream.

Baked Pears.—Remove the skin and leave the pears whole, or cut them into quarters and take out the cores. Put into a deep earthen dish. To each pint of fruit add quarter cup brown sugar, quarter cup water. Cover, and bake in a moderate oven until soft. This dish is good if baked one hour, but becomes richer if cooked three or four hours. Apples, peaches and quinces may be baked in the same way.

Apple Sauce.—Quarter, pare and core sour apples. Put them into an agate saucepan, with just enough water to keep them from burning, and cook until soft. Stir in sugar, allowing half cup sugar for six medium-sized apples, and boil five minutes. Strain through a wire strainer. Cool and serve.

Stewed Apricots.—Wash one pound dried apricots carefully, taking each piece in the fingers. Put them into a pan with three cups water, and soak two hours or over night. Then cover them and stand them over a moderate fire. Let them come to a boil, and cook gently ten minutes. Add half cup sugar and cook five minutes longer.

Stewed Prunes.—Prepare and cook them in the same manner as apricots. One pound of prunes will require a quarter cup of sugar. Just before removing from the stove, add two tablespoonfuls lemon juice. The prunes should be soft, but not broken.

Stewed Cranberries.—Take four cups cranberries. Pick them carefully. Put them into a pan with a cup of water, and cover them closely. Stand them over a moderate fire, let them come to a boil, and cook gently eight minutes. Add two cups of sugar, and cook two minutes longer. When cold the skins will be tender and the juice will form a delicate jelly.

Cranberry Jelly.—Cook the fruit as directed in the above recipe and press it through a strainer into a mold or glass dish.

Cranberry Sauce.—Put a quart of ripe cranberries into a saucepan with a teacupful of water. Stew slowly, stirring often; cook ten minutes. Take from fire and sweeten well with white sugar. Put into a mold. Or strain the pulp through a sieve into a mold wet with cold water, and when firm turn into a glass dish. Eat with roast turkey or game.

Steamed Rhubarb.—Wash one cup of rhubarb and cut it into inch pieces without removing the skin, as this gives a pretty pink color to the juice. Put it in an agate double boiler without water, sprinkle one-third cup of sugar over it and steam half hour, or until soft. Do not stir it, as it breaks the pieces.

Ices and Ice Cream.

General Rules.—Ice (or snow) and salt are necessary for freezing cream, fruit, etc. Salt melts the ice, and in melting it absorbs heat from the cream, thus causing the cream to freeze. For each cup of rock salt used, allow three cups of broken ice. Pound ice in a bag or piece of carpet.

To pack the freezer: Put three cups pounded ice around the can, then sprinkle one cup of rock salt, and pack in alternate layers of ice and salt until within an inch of the top of the can. Let it stand from ten to twenty minutes to chill, then turn or beat until the cream is frozen. Pack away with ice and salt around and over the can.

Vanilla Ice Cream.—One quart of cream, one pint of milk, two cups sugar, one tablespoonful vanilla, white of one egg, beaten; strain cream. For peach ice cream leave out vanilla and add one quart of peaches, mashed fine, after cream is partly frozen.

Put the mixture into a can with a tight cover and stand it in a pail. Pack the ice and salt around it, beat the cream, and turn the can back and forth, opening it once in five minutes to scrape the cream from the sides of the can and stir thoroughly. It should freeze in twenty minutes.

Strawberry Ice Cream.—One quart cream, one pound sugar, one and a half quarts strawberries; put one teacup new milk and half the sugar on to boil in a double boiler; when sugar is dissolved set aside to cool; rub the berries through a colander, and then add the remaining half of the sugar to them; pour the sweetened milk and cream into the freezer and freeze; when nearly done add the berries and beat thoroughly.

Banana Ice Cream.—Remove the peel from eight ripe bananas, mash them into a pulp, then beat them thoroughly with one quart of cream. Sweeten and freeze the same as ordinary cream. The bananas may be grated or chopped fine.

Chocolate Ice Cream.—Melt one and one-half squares Baker's Chocolate and dilute with hot water to pour easily, add one quart thin cream; then add one cup sugar, a sprinkle of salt, and one tablespoonful vanilla, and freeze.

Orange and Lemon Water Ice.—Juice of four lemons, juice of four oranges, four cups sugar, four cups water, whites of four eggs, well beaten, add last, then freeze very slowly.

Lemon Water Ice.—To the juice of six large lemons add one quart water and one quart sugar. Make a syrup of part of the water and sugar, then add lemon juice and rest of water. When half frozen add whites of four eggs beaten to a stiff froth.

Fruit Ices.—Take three each of oranges, lemons and bananas, and one pint of strawberries or raspberries. Put the fruit into a course strainer and rub it through into a large bowl. Pour three cups of cold water through the strainer, add three cups of sugar. Stir and freeze.

Lemon Sherbet.—Juice of four lemons, strained, one quart water, one and a half pints granulated sugar, one-fourth box Pink Plymouth Rock gelatine, soaked in cold water half an hour; place in vessel in warm water to melt; one teaspoonful vanilla, one pinch soda; mix all together, then put in freezer and when nearly done add the well-beaten white of one egg, then freeze until solid. Sufficient for fourteen persons.

Pineapple Sherbet.—Two large pineapples or one quart can, one and one-fourth pounds sugar, juice of two lemons, one quart of water. Pare the pineapples, cut them, and remove the cores, or the pineapple may be grated around them; boil the sugar and water together for five minutes, take it from the fire, add the grated pineapple and the juice of the lemons; strain through a cloth, pressing hard to get all the juice. Freeze, and when almost done add the meringue, which is made as follows: Beat the white of one egg until frothy, then add a tablespoonful of powdered sugar and beat until white and stiff.

Milk Sherbet.—Put one quart of milk into the can and let it freeze five minutes. Mix together two cups of sugar and the juice of three lemons; stir into the milk, and freeze.

Pickles and Salads.

Gherkin Pickles.—Use small cucumbers or gherkins. Pack in a stone jar in layers, salting each layer thickly. Cover the top layer deep with salt, pour cold water to cover all, and weight with a board and stone. Leave in the brine a week to a month, stirring up daily. When ready to put up, throw off the brine and pick out any softened cucumbers. Soak for a day in fresh water. Then change the water and leave another day. Put them now in a kettle, lined with vine leaves, throwing in a little powdered alum; fill with water, cover with vine leaves, and steam five or six hours. When the pickles are green take out the leaves, and throw the pickles into ice-cold water.

To one gallon of vinegar add a cup of sugar, three dozen each whole black peppers and cloves, half as much allspice and a dozen blades of mace. Boil five minutes. Put the cucumbers into a stone jar, and pour over them the scalding hot vinegar.

Scald the vinegar several times, at intervals of two to five days, and return. Finally cover the jar and put in a cool dry place. The pickles will be ready for use in two months. They should be examined at intervals of a few weeks.

Cucumber Pickles.—Wash cucumbers carefully and put in weak salt water over night. In the morning drain them and put on stove in weak vinegar, half vinegar and half water, to which has been added alum, a piece the size of a small hickorynut to a gallon. Let them heat slowly until scalding hot. Have ready in another kettle good cider vinegar to which has been added sugar, in the proportion of one teacup sugar to one quart vinegar. Have cans hot and pack cucumbers in closely, scattering mixed spices through them as desired. When can is full pour over the sweetened vinegar, boiling hot, and seal.

Pickled Beets.—Boil until quite soft; when cool cut lengthwise to size of small cucumbers, boil equal parts vinegar and sugar with half a tablespoonful ground cloves, tied in a cloth, to each gallon; pour boiling hot over the beets.

Pickled Onions.—Peel the onions, cook in salt water till they begin to get tender. Take out of water and drain, pack in cans, take enough hot vinegar to cover them, add sugar and spices to taste.

Pickled Cauliflower.—Break three heads in small clusters, lay in salted water three minutes, then drain, use small onions if liked. Boil one quart cider vinegar, and one cup sugar together. Mix mustard, celery seeds or spices to suit taste. Put in jars, pour over vinegar while hot, seal.

Pickled Cabbage.—Chop cabbage fine, take enough for one-half gallon can, put in tablespoonful of salt, let stand over night, drain and add two tablespooonfuls of mustard seed, one pod of red pepper and horseradish. Mix well, then put in can, press tightly; then pour over cabbage enough vinegar to cover, seal in glass self-sealers

Chow Chow.—Take six cucumbers just before they ripen, peel and cut in strips and remove the seed, four white onions, six good-sized heads of cabbage, chop all fine; let them stand in salt water over night. Then pour off the water, and add vinegar and spices to suit taste.

Tomato Pickles.—Slice thin one gallon green tomatoes, salt and let stand over night; next morning drain, chop one gallon cabbage, grate one quart horseradish. Put tomatoes on in vinegar, boil until tender, pour over cabbage, let stand till cool, and drain. Mix horseradish, celery, mustard seed and mixed spices; then boil vinegar and sugar and pour over them.

Piccalilli.—One peck green tomatoes, one dozen onions, six red peppers, one-half ounce ginger, one-quarter of an ounce of mace, one tablespoonful black pepper, one box of mustard, five cents' worth of celery seed, one pound of brown sugar; slice onions, tomatoes, and peppers, put in a jar with salt, mix well, let stand twenty-four hours; drain off and boil in vinegar (after adding the spices) until clear.

Mixed Pickles.—One-fourth peck green tomatoes, twelve large pickles, three dozen small pickles, eight large onions, two heads cauliflower, one pint small green beans, one pint salt. Place in jar, let stand over night, rinse in cold water. Take equal parts vinegar and water, put in the ingredients, boil until tender (about ten minutes), drain, put three quarts vinegar, one pound brown sugar, one-half pound mustard seed, five cents' worth turmeric, one-fourth pound ground mustard, four tablespoonfuls black pepper, one ounce celery seed. Let come to a boil, put in jar and seal.

Tomato Sweet Pickles.—Slice tomatoes, salt and let stand over night; then drain well and place in porcelain kettle and cover with vinegar; let come to boil, then lift out the slices with a fork and place in cans previously heated. Have a syrup ready. Two pints sugar, one of vinegar, with spices to taste; let boil till thick and pour over tomatoes, then seal.

Ripe Tomato Pickles.—For seven pounds of tomatoes, make a syrup of one quart of vinegar and four pounds of sugar. Scald, skin and drain the tomatoes. Boil them in the syrup, adding a little stick cinnamon. Must boil a long time, or until quite thick, or they will not keep unless in air-tight cans.

Pickled Pears.—One quart of vinegar, two quarts sugar; boil together; pour over pears; let stand over night. In the morning pour hot boiling syrup on pears; let cook until tender; put fruit in cans; add one-half ounce of cloves, one ounce stick cinnamon; boil in syrup until thick. For one gallon of pears.

Pickled Peaches.—For six pounds of fruit use three of sugar, about three dozen cloves, and a pint of vinegar. Put one or two cloves into each peach. Have the syrup hot; cook until tender.

Pickled Cherries.—To every quart of cherries (fresh tart ones) add a cupful of vinegar and two tablespoonfuls of sugar, with a dozen cloves and six blades of mace. Boil the vinegar, sugar and spices five minutes, and after it has cooled strain out the spices, and pour the vinegar over the cherries, which have been placed in jars till three-quarters full. Cork or cover tight.

Higdin Pickle.—Take one peck green tomatoes and a dozen medium-sized onions. Cut and slice these, and salt and mix together. Let them stand over night, then drain them well, and add one ounce each of cloves, allspice and pepper, and a quarter pound of mustard seed, also a pound of sugar and horseradish to taste. Place the mixture in an earthen vessel, cover with vinegar, and cook over a slow fire until tender.

Pickled Oysters.—Put 150 oysters into a suitable vessel, and salt to taste; then put over a slow fire, bringing the liquid to a simmer, not a boil. Take out the oysters and put into a stone pot. To the liquid in the saucepan add a pint of good vinegar, a few heads of mace, three dozen each of whole cloves and pepper, and let come to a boil. When the oysters are cold pour the liquid over them.

Tomato Catsup.—Boil for half an hour three gallons of good ripe tomatoes. Strain through a sieve. Then put on and boil down to two gallons. While boiling add two ounces each of whole cloves, allspice and cinnamon, and a quarter pound of black pepper. When done take off, cool, add one-quarter pound mustard and half a pound of sugar. Stir well, and put in a quart of best cider vinegar for each gallon. Bottle and seal up for winter use.

Apple Salad.—Take one-third more apples than celery (chopped), put in as many English walnuts or hickorynuts as you like. Dressing; Yolks of three eggs, beaten, one teaspoonful mustard, two teaspoonfuls of salt, one-fourth saltspoonful of cayenne, two tablespoonfuls sugar, one tablespoonful butter, one cup cream, one-half cup of hot vinegar. Whites of three eggs, beaten stiff; cook in a double boiler until it thickens like soft custard.

Cabbage Salad.—Two quarts of chopped cabbage, two level tablespoonfuls white sugar, one of black pepper, one of mustard. Rub yolks of three hard-boiled eggs until smooth. Add two tablespoonfuls butter, slightly warmed. Mix with cabbage and add one teacup good vinegar. Serve with whites of eggs, cut in rings and placed on salad. Salt to taste.

Cold Slaw with Cream Dressing.—Slice cabbage fine, season with salt. Make a dressing of one-half cup whipped cream, two tablespoonfuls sugar, four of vinegar and pour over cabbage.

Cold Slaw.—Chop cabbage fine, then put in a crock, add sugar, salt and pepper to taste; mash all together with a potato masher until juicy; add either sweet or sour cream to make real moist, and vinegar to suit taste.

Cooked Slaw.—One small head of cabbage cut fine; put one tablespoonful butter in a skillet; when melted, stir in the cabbage. Mix the yolk of one egg, one-third cup vinegar, a little mustard, sugar and salt, pour on the cabbage and heat, then serve.

Lettuce with Cream Dressing.—Carefully look over and wash lettuce, and tear in pieces. To two tablespoonfuls fresh meat fryings add one tablespoonful flour, while hot add one cup sour cream, salt and pepper, stir rapidly until it thickens, then pour over lettuce and stir very little, dish up and lay slices of hard-boiled eggs over the top. Sugar or vinegar may be added at the table.

Nut Salad.—Mix one cup chopped English walnut meats, with two cups celery or shredded lettuce leaves; arrange on lettuce, and serve with Mayonnaise dressing.

Potato Salad.—Slice thin, eight cold boiled potatoes, and cover with a dressing made as follows: Yolk of one hard-boiled egg, mashed fine, one teaspoonful of mixed mustard, four tablespoonfuls of melted butter, four tablespoonfuls of vinegar, salt and pepper. Finely chopped onion may be added.

Fruit Salad.—To one package Plymouth Rock gelatine, add a pint of cold water, the juice of four lemons, the grated rind of one. Let stand one hour. Add one pint boiling water, two cups sugar. Let boil and strain through a cloth into a mold. When about to congeal stir in fruit. One pound white grapes, seeded, one-half pound candied pineapple, one-half pound candied cherries, cut in pieces. Let stand on ice to cool and harden, then serve.

Tongue Salad.—Boil, skin and trim a tongue, cut in dice and add the whites of six hard-boiled eggs cut in similar pieces. Cut fine the white stalks of three heads of celery and mix with tongue and eggs. Make a dressing as follows: Beat together four eggs, six tablespoonfuls of vinegar, five of melted butter, one of prepared mustard, one of sugar and two-thirds of a cup of cream. Put over the fire in a double boiler and cook until as thick as boiled custard. Set aside to cool; season with salt and pepper, thin with lemon juice, mix with the tongue and other ingredients, and serve.

Cream Salad Dressing.—Mix one-half each, salt and mustard, with one tablespoonful of sugar, add one beaten egg, two and one-half tablespoonfuls butter, and three-fourths cup sweet cream, add slowly one-fourth cup vinegar; cook until it thickens, then strain and cool.

Mayonnaise Sauce.—Mix in a two-quart bowl one even teaspoonful ground mustard, one of salt, and one and a half of vinegar, beat in the yolk of a raw egg. Then add very gradually a half pint of pure olive oil. Beating briskly all the time. The mixture will become a very thick batter. Flavor with vinegar or fresh lemon juice. If covered closely it will keep for weeks. If the dressing curdles, take another yoke of egg and add to it the curdled mixture slowly, stirring constantly.

Salad Dressing.—Yolks of three eggs, one tablespoonful sugar, a lump of butter size of a small egg, a pinch each of salt, and cayenne pepper, one teaspoonful of prepared mustard. Stir all together, add one-half pint of vinegar, set over fire and stir constantly until it becomes about like custard. This will keep several days in a cool place. Very nice served with nice ripe tomatoes. Peel and cut out a little of the top with a teaspoon; serve it on a lettuce leaf with the salad dressing.

Salad Dressing.—Yolks of three eggs, one teaspoonful mustard, one teaspoonful salt, a sprinkle of cayenne, two tablespoonfuls of butter, one cup milk, or cream. Stir the above together. When well beaten, pour over one-half cup of hot vinegar. Have ready the whites of three eggs, beaten stiff. Cook in double boiler, stirring all the time it is cooking, using an egg beater to stir with. Cook until cream thickens, then bottle. If one bottle of good salad dressing is mixed with the above recipe, it is improved.

Potato Salad.—Boil four or six potatoes, cut in thin slices, pour the hot dressing over and let it stand until cold. Two tablespoons chopped celery may be mixed with the potatoes, and one teaspoon onion juice may be stirred into the dressing after it is cooked. Serve in the same manner as the meat salads. Sliced boiled beets are some times added.

Tomato Salad.—Pour boiling water over four or six tomatoes, and let it stand a moment. Pour off, and add cold water. slip off the skins, slice, and set away to become cold. Serve with the cold dressing. If desired, the slices of tomatoes may be served on lettuce leaves.

Tomato Catsup.—Take a peck of ripe tomatoes, cut each, and boil in a porcelain kettle until the juice is extracted and the pulp dissolved. Press through a colander, then through a hair sieve. Return to kettle;

season with an ounce each salt and mace, a tablespoonful each black and cayenne pepper, powdered cloves, and celery seed (in a thin bag), and same of ground mustard. Boil five hours, stirring frequently and in the last hour constantly. Let stand twelve hours in a stone jar in cellar. Add a pint of strong vinegar; take out the bag of celery seed, and bottle for use. Keep in a cool, dark place. Of the numerous catsups, this is the most useful for ordinary purposes.

Cold Slaw.—Take a fresh, crisp cabbage, and pull off the loose and torn leaves. Cut it into several pieces, and shave each piece into very thin strips. Strain the salad dressing, while hot, over the cabbage, mix it well, spread it out, and set it away to cool. When ready to serve, arrange in a neat mound in the centre of a clean dish. If the cabbage is wilted, soak it for an hour or more in cold, salted water.

Lettuce Salad.—Pick over the leaves carefully and see that they are whole, clean and free from insects. Wash them in cold water, and shake the leaves gently in a cloth to dry them. Arrange on a flat dish with the smaller leaves inside the larger, and serve, with the cold salad dressing on the table.

Boil hard one-half dozen eggs. When cold chop fine with stalks and tender leaves of a root of celery, and a handful of green parsley. Pour over the mixture a sauce made by rubbing together a dessertspoonful of mustard with the same quantity of salt and two spoonfuls of granulated sugar, into which beat well, five spoonfuls of olive oil and five of vinegar.

Candies and Confections.

Butter Scotch.—One cup of light brown sugar, one-half cup of hot water, a tablespoonful of butter, a tablespoonful of vinegar; boil about twenty minutes, testing in cold water; when it begins to thicken it can be flavored by adding half a teaspoonful of lemon or vanilla if desired. Pour on buttered plates and mark into squares as it cools.

Chocolate Caramels.—One and a half pound of brown sugar, one cup of cream, one tablespoonful of butter, half a cake of Baker's chocolate. Mix all together and let cook, stirring frequently until done. Drop a little in water; if done it hardens at once. Just before pouring in pan flavor with vanilla or lemon. Pour in a buttered dish, and before it gets perfectly cold cut in squares by running a knife across the dish. It will break when cold.

Vanilla Caramels.—Two cups of sugar, one-half cup of water, one-fourth cup of vinegar; boil until it will harden when dropped in water, then add one-half cup of cream and two teaspoonfuls of vanilla. Stir to prevent scorching. When it will harden if dropped in water, pour into a greased pan so it will be a half inch thick. When cool enough, cut in squares and wrap in paraffine paper.

Soft Caramels.—Make either with or without nuts. Whites of two eggs beaten stiff, half cup of corn starch, eight tablespoonfuls of pulverized sugar. Stir until stiff enough to manipulate with the hands, then work just with the fingers.

Cocoanut Caramels.—One cocoanut grated fine; take the milk of the cocoanut and add sufficient water to make one pint, to this add three pounds of white sugar. When it boils up well, add one-half teaspoonful cream of tartar dissolved in a little water; boil until it will make a soft ball when dropped in water, then add the grated cocoanut; remove from the fire and beat until it begins to get white—if beaten too long it will crumble; pour into shallow pans and when partly cold cut in squares.

Ice Cream Candy.—Two cups granulated sugar, a scant half cup water, a lump of butter the size of a walnut, and one quarter teaspoonful cream of tartar. Flavor with vanilla. Boil until it cracks when dropped into water. Do not stir. Pour in buttered tins, and when cool pull until white.

Maple Creams.—One cup maple sugar, one-half cup cream or milk, lump of butter; boil until it brittles in cold water. Let stand until cool, then beat to a cream. Put in buttered tins and cut in squares.

English Kisses.—Whites of two eggs beaten dry and stiff, one-half pint granulated sugar, one teaspoonful vanilla, mix thor-

oughly; drop in drops on greased manilla paper and lay half kernels of English walnuts on the top. Bake a light brown.

Molasses Candy.—One quart good molasses, one-half cup vinegar, one cup sugar, butter size of an egg, one teaspoonful baking soda. Boil molasses, sugar and vinegar until it hardens when dropped in cold water, then add butter, and the soda dissolved in hot water; flavor to taste. Pour in buttered dishes and pull when cold.

Taffy.— Put into a pan half cup of butter, two cups brown sugar, and the juice of a lemon or four tablespoonfuls vinegar; stand it over a moderate fire. Stir until it begins to bubble, then draw it to one side of the stove and let it boil slowly. Test occasionally by dropping a little into cold water. If it hardens at once, it is done. Stir in shelled peanuts or walnuts and pour into buttered pans.

Chocolate Creams.—Beat the white of one egg and add to it two tablespoonfuls cold water and half teaspoonful vanilla. Stir in gradually enough confectioner's or XXX sugar to make a stiff dough. Roll into balls the size of marbles, and let dry one hour. Melt quarter pound chocolate in a bowl and put the balls into it in succession. Lift out each ball with a fork and place it on greased paper to harden.

Walnut Creams.—Open English walnuts carefully, that the half-kernels may not be broken. Press the two halves into opposite sides of a sugar-ball, as above described.

Date Creams.—Remove the seeds from dates. Roll sugar-balls into cylinders and press them into the spaces from which the date seeds were taken.

Cherry Creams.—Buy quarter pound red candied cherries. Cut each cherry partly open, and press into the opening a small ball of the sugar mixture.

Lemon or Orange Creams.—Take one teaspoonful of white of egg and mix with it one tablespoonful lemon or orange-juice. Add enough sugar to make a dough, roll it into balls and let it harden.

Fruit Creams.—Take one tablespoonful Sultana raisins, two figs, four dates, and one tablespoonful nut kernels. Chop the fruit very fine and stir all together. Take a portion of the sugar dough, above described, and mix with it the chopped fruit. Roll the mixture into balls, or pat it flat and cut into small squares.

Home-made Candy.—Two pounds white sugar, one pint water; boil until it cracks when dropped in cold water; add three tablespoonfuls vinegar and one-half teaspoonful soda; flavor to taste.

Peanut Candy.—Two cups granulated sugar, one cup chopped peanuts, no water. Put sugar over a slow fire; it melts very slowly. After it has melted a little it turns into very hard lumps, then melts again. When it is free from lumps remove from fire, pour it over the peanuts, stirring with a spoon to prevent them collecting at the bottom of the pan. When cool mark into squares.

Peppermint Drops.—One-half cup sugar, one-half cup water, one teaspoonful vinegar. Boil until done, then beat fast with a fork. Before it gets cold add five drops peppermint oil, beat thoroughly, let fall in drops on buttered paper.

Sugar Candy.—Six cups white sugar, one cup vinegar, one cup water, one tablespoonful butter put in at the last with one teaspoonful soda, dissolved in hot water. Boil without stirring one-half hour. Flavor to suit taste.

Walnut Macaroons.– One cup walnut meats chopped fine, one cup sugar, a little salt, three tablespoonfuls flour. Cook in a buttered tin in a slack oven. When done cut in small squares and lift from tin while warm.

Pop-Corn Balls.—Pop the corn and reject all the hard kernels; place in a large pan. To eight quarts of corn take one pint sugar, scant one-half teaspoonful cream of tartar, and a little water. Boil all together until it hardens in water, then pour over the corn and make into balls.

Beverages.

Tea.—The water for tea should be freshly boiled. An earthenware pot should be used. Scald the pot, put in one teaspoonful tea,

and pour on one cup of boiling water. Cover it and let it steep five minutes. Never allow tea to boil.

Coffee.—To one tablespoonful ground coffee add an eggshell or one-half teaspoonful white of egg and one tablespoonful cold water. Mix together and pour on one cup freshly-boiled water. Let it come to a boil; then steep five minutes. A little boiling water may be poured in the spout of the coffee-pot to clear away the grounds. Serve with loaf sugar and hot cream or milk.

Left-over coffee may be used if poured off the grounds immediately. Keep it in a cool place until needed. Wash the pot out carefully after using.

Filtered Coffee.—Use pulverized coffee. Put one teaspoonful into the upper part of a double coffee-pot and pour one cup boiling water through it. Let it stand a few minutes on the back part of the stove, where it will not boil. Then remove it, and serve.

Cereal Coffee.—Put two tablespoonfuls cereal coffee into the pot and pour a pint of boiling water over it. Let it boil fifteen minutes. Strain and serve with sugar and hot cream or milk. As cereal coffee is made of browned grain, it is a wholesome drink, and is not stimulating.

Chocolate.—Grate chocolate, allowing six tablespoonfuls for one quart of water; mix smooth with a little water, and boil ten minutes; add one quart rich milk, boil five minutes longer, and serve hot with sugar.

Cocoa.—For one cup, take one teaspoonful of cocoa, add either boiling milk or water, or half each; sweeten to taste.

Cream Nectar.—To one gallon boiling water add four pounds granulated sugar and five ounces tartaric acid. Beat the whites of three eggs, and pour into a bottle with a little of the warm syrup; shake briskly, then pour it into the kettle of syrup, and stir it through well. Boil three minutes, removing the scum as it rises. Flavor with any preferred extract, and bottle for use. When wanted to use, take two or three tablespoonfuls of the syrup to a glass of ice-cold water and one-half teaspoonful of soda.

Grape Juice.—Weigh grapes before picking from stem, then pick from the stem and put in a kettle. Add a very little water, cook until stones and pulp separate; strain through a cloth and return juice to kettle. Add three pounds of sugar to ten pounds of grapes previously weighed; heat just to simmering. This makes one gallon.

Lemon Syrup.—Take the juice of twelve lemons; grate the rind of six in it, let it stand over night; then take six pounds of white sugar, and make a thick syrup. When it is quite cool, strain the juice into it; put in bottles, securely corked, for future use. A tablespoonful in a glass of water will make a delicious drink on a hot day.

Lemonade with Fruit.—Use six lemons to a gallon of water; squeeze the juice from lemons and add two teacups of sugar; dissolve and strain. Then add juice of fruit, either cherries or raspberries, or any other fruit you like as a variety.

Fruit Punch.—One dozen lemons, one-half dozen oranges, one can of pineapple; boil four cups of sugar in four pints of water ten minutes; cool, and add one gallon of water. Grate the pineapple, press juice from the lemons and oranges, strain through a coarse towel, serve with cracked ice.

Raspberry Shrub.—Cover the berries over night in a stone jar with vinegar, next morning strain and to one pint of juice put one pint of sugar. Boil ten minutes, bottle hot. Boiled longer will jelly.

Dishes for the Sick.

Beef Tea.—One pound of lean beef cut fine, put in a glass fruit jar, without water, cover tightly and set in a pot of cold water. Heat gradually to a boil and keep hot for three or four hours, until the meat is light-colored and the juice is all drawn out. Season with pepper and salt.

Invalid's Cream Hash.—Boil a good lean, tender, piece of beef until well done; chop fine two tablespoonfuls of the meat; roll four crackers fine, salt and pepper. Mix all together, cover with sweet cream, set in the stove and heat.

Barley Water.—Put a large tablespoonful of pearl barley in a pitcher, pour over it

boiling water, cover and let stand till cold, then drain off the water, sweeten to taste. If desired add the juice of a lemon and grated nutmeg.

Broiled Oysters.—Select large oysters. Lightly grease with butter a wire broiler, place oysters on it and broil over hot coals, watching them closely as they cook quickly. When the edges begin to look ruffled turn them and in a short time they will be done. Have ready a slice of bread nicely toasted and buttered slightly. Place the oysters on it, salt, pepper and butter slightly. Let stand in oven a minute or two. This is a most tempting dish for a sick person.

Oatmeal Gruel.—Mix together two tablespoonfuls of oatmeal, one-fourth teaspoonful salt, one teaspoonful sugar and one cup boiling water. Cook thirty minutes and strain through a fine wire strainer to remove the hulls. Add one cup milk and heat to boiling-point.

Eggs for Invalids.—Put them in a pan, pour boiling water over them, set back on the stove five minutes; season to taste. After eating them this way the sick will not want them any other way.

Corn Meal Gruel.—Stir slowly two tablespoonfuls of corn meal in one quart of boiling water, cook twenty minutes, stir often, add hot water if too thick.

Mutton Broth.—Take two pounds mutton, put in a sauce-pan, with two quarts of cold water and one ounce of pearl barley or rice. When it boils skim well; add one-half teaspoonful of salt; let boil until reduced to one-half. Strain it off and skim off all the fat.

Clam Broth.—Take twelve small hard-shell clams, chop fine, add one-half pint clam juice, or hot water, a pinch of cayenne pepper, small lump butter; simmer thirty minutes, add one gill boiling milk. Strain and serve.

Toast Crackers or Bread Panade.—Toast crackers or stale bread until very brown. Pour over them hot water to cover; cover tightly and steep until cold. Strain and sweeten to taste or drink hot with cream and sugar. Or add lemon juice or a very little nutmeg.

Oyster Toast.—Take six oysters, strain off the liquor, add to it one-half cup milk. When hot add the oysters; boil one minute. Season with butter, salt and pepper. Then pour over hot buttered toast and serve.

Flax Seed Tea.—To one tablespoonful of flax seed add one pint of cold water. Boil slowly for one hour; add sugar to taste and the juice of one lemon. Very good for a cough.

Koumyss.—Heat two quarts of perfectly fresh milk to 165 degrees. Boil together two tablespoonfuls of sugar and two of water; add this to the milk. When it has cooled to 100 degrees, add one-third of a yeast cake dissolved in warm milk. Mix by pouring from one vessel to another. Bottle, cork and tie. Stand upright in a moderately cool place (60 degrees) for twelve hours; then turn the bottles on their sides in a cool place (40 degrees to 50 degrees) for twenty-four hours, and it is ready for use. Open with a syphon.

Cooling Drinks in Fever.—Crush a bunch of Malaga grapes, pour over them one pint of hot water; let stand until cold. Or pour one-half pint of boiling water over one tablespoonful of currant jelly, and stir until jelly is dissolved. Other jellies are good prepared in like manner.

Menus for Various Occasions.

Breakfast.

Fruit.
Oat Meal. Cream and Sugar.
Broiled Steak.
Fried Potatoes.
Biscuit. Coffee.

Lunch.

Cold Chicken.
Saratoga Chips.
Apple Sauce. Wafers.
Chocolate.

Dinner.

Tomato Soup.
Roast Lamb. Mint Sauce.
Boiled Potatoes.

Asparagus on Toast.
Cabbage Salad.
Wafers. Cheese.
Peach Ice Cream. Sponge Cake.
Coffee.

Breakfast.

Fruit.
Breakfast Food. Sugar and Cream.
Broiled White Fish.
Baked Potatoes.
Griddle Cakes. Maple Molasses.
Coffee.

Dinner.

Vegetable Soup.
Fried Chicken. Cream Gravy.
Mashed Potatoes.
Sweet Potatoes.
Tomato Salad.
Wafers. Cheese.
Cherry Pie.
Tea.

Supper.

Thin Slices Cold Boiled Ham.
Pepper Sauce. Thin Bread and Butter.
Potato Salad. Cheese Straws.
Raspberry Float. White Cake.
Tea.

Breakfast.

Fruit.
Wheatlet, Sugar and Cream.
Broiled Pork Chops.
Browned Potatoes. Rice Pancakes.
Coffee.

Dinner.

Tomato Soup.
Roast Duck. Currant Jelly.
Sweet Potatoes. Mashed Turnips.
Stewed Celery. Lettuce Salad.
Wafers. Apple Pie. Cheese.
Coffee.

Supper.

Oysters on Half Shell.
Broiled Quail on Toast.
Potato Chips. Olives
Sliced Oranges. Crullers.
Tea.

A Formal Breakfast or Luncheon

Bouillon in Cups. Wafers
Sweetbreads. Rolls.
Broiled Chicken, Cream Sauce.
Peas.
Tomatoes, Mayonnaise Dressing
Thin Bread and Butter.
Charlotte Russe in Molds.
Coffee.

A Wedding Breakfast.

Grape Fruit.
Corn Fritters.
Dumplings stuffed with Cheese,
Cream Sauce.
Biscuits.
Mayonnaise of Tomatoes.
Toasted Bread Fingers.
Ice Cream. Sponge Cake.
Coffee.

A Formal Dinner.

Oysters on the Half Shell.
Horseradish Sauce. Wafers.
Clear Lintel Soup. Croutons.
Olives. Radishes. Celery.
Boiled Cod Shoulder and Head.
Fish Sauce. Potato Balls.
Cucumbers with French Dressing.
Roast Chicken with Chestnut Stuffing.
Cranberry Sauce. Rice Croquettes
Mint Sherbet.
Roast Small Birds, Sippets of Bread.
Guava Jelly.
Lettuce Salad with French Dressing
Charlotte Russe.
Wafers. Cheese.
Coffee.

Thanksgiving Dinner.

Oyster Soup.
Olives. Celery.
Roast Turkey. Chestnut Dressing
Cranberry Sauce. Pickles. Sweet Pickles
Fruit Salad.

Scalloped Potatoes. Sweet Potatoes.
French Peas. Scalloped Oysters.
Cherry Ice.
Sweet Pudding. Sauce.
Mince Pie. Pumpkin Pie.
Cheese.
Lemon Jelly with Nuts.
Chocolate and Fruit Cake.
Bonbons. Almonds.
Coffee.

Christmas Dinner.

Creamed Clams. Wafers.
Mixed Pickles.
Roast Turkey with Oyster Dressing.
Oyster Sauce.
Celery. Spiced Currants.
Sweet Potatoes. Mashed Potatoes.
Scalloped Corn.
Lemon Orange Ice.
Cold Boiled Ham. Horseradish Sauce.
Tomato Salad. Boston Brown Bread.
English Plum Pudding with Sauce.
Pine Apple Sherbet. Fancy Cakes.
Coffee.
Nuts. Home-made Caramels. Fruit.

Quick Meals.

Breakfast.

Fruit.
Boiled Eggs. Milk.
Coffee. Toast.

Dinner.

Beef Stew.
Hashed Brown Potatoes.
Sliced Tomatoes.
Junket.

Supper.

Toast and Cheese. Brown Bread.
Mayonnaise of Cabbage.
Tea.

Breakfast—in 15 Minutes.

Fruit.
Boiled Rice. Toast.
Coffee.

Luncheon—in 20 Minutes.

Fricasse of Dried Beef.
Graham Bread.
Cocoa. Crackers.

Dinner—in 30 Minutes.

Clear Soup.
Broiled Chops. Baked Rice.
Panned Tomatoes.
Lettuce Cheese.
Coffee.

Small Evening Parties.

Thin Slices Bread. Butter.
Tongue Salad. Cucumber Pickles.
Coffee.

Clam Sandwiches. Mixed Pickles.
Fruit Salad. Cheese Straws.
Tea.

Ham Salad.
Thin Slices Boston Brown Bread.
Butter. Pickles.
Vanilla Ginger Bread.
Coffee.

Oyster Sandwiches. Chow Chow.
Wafers. Cheese.
Chocolate.

Afternoon Receptions.

Clam Broth in Cups. Wafers.
Salmon Sandwiches. Olives.
Tongue Salad in Tomatoes.
Coffee.
Strawberry Ice Cream.
Angel Food. Chocolate Cake.
Bonbons. Salted Almonds.

Chicken Sandwiches. Olives.
Sweetbread with Peas.
Fruit Salad on Lettuce Leaves.
Cheese Straws.
Coffee. Cake.
Neapolitan Ice Cream. Cream Cake.
Salted Mixed Nuts. Bonbons.

Oyster Soup in Cups. Wafers.
Celery.
Chicken Salad. Bread.
Lemon Jelly with Nuts.
Coffee.
Banana Ice Cream. Three-Ply Cake.
Salted Pecans. Olives.
Home-made Caramels.

Small Picnics.

Cold Chicken.
Lettuce, French Dressing.
Bread-and-Butter Sandwiches.
Olives.
Cocoanut Jumbles. Lemonade.

Cold Tongue. Brown Bread and Butter.
Sliced Tomatoes.
Tea. Gingerbread.
For the children, Whole Wheat Bread and Milk, Fruit, Gingerbread.

Cheese Sandwiches.
Stuffed Eggs. Bread and Butter.
Fruits.
Fruit Sandwiches. Cinnamon Bun.
Coffee or Lemonade.

Thin Cold Corned Beef.
Brown Bread and Butter.
Sliced Tomatoes, Plain.
Coffee.
Peaches. Water Thins

TABLE-SETTING AND SERVING

A table should be made to look as neat and attractive as possible.

Dust the table, and lay evenly on it a cloth of felt-flannel or cotton-flannel. Spread the tablecloth evenly over this. The undercloth prevents the dishes from making a noise, preserves the tablecloth and gives the table a better appearance.

The tablecloth should be laid with the hemmed edges underneath, and the lines in the cloth parallel with edges of the table.

The knife is placed at the right hand, with the sharp edge turned to the left; and the fork at the left hand with the prongs pointing upward. A spoon is placed to the right of the knife and the napkin to the left of the fork. All these articles should be about two inches from the edge of the table. The tumbler is placed at the end of the knife blade and the butter plate at the end of the fork. When bread and butter plates are used, place one at the left of each fork.

The Breakfast Table.—Proceed as directed above, with the addition of the carving knife and fork at the right hand of the one who carves, and with the salt and pepper bottles together near the ends or opposite corners of the table.

Arrange the tea or coffee service around the place of the one who is to serve it. Put the tea or coffee-pot on a stand at the right side, with the handle toward the right; next the cream pitcher, with the handle to the right; then the sugar bowl and spoon-holder. At the left hand arrange the cups and saucers.

When mush or breakfast food is used, place a tablespoon, with the handle toward the right, in front of the one who is to serve, and saucers to the left of the tablespoon. The mush, in a covered dish, should stand directly in front of the one who serves it.

The butter should be placed near some one who can conveniently serve it, and the butter-knife in front of the dish, with the handle at the right.

In serving meat, place the platter before the one who is to carve, with the pile of hot plates directly in front or at the left of the carver.

Plates containing hot muffins or rolls should be at opposite ends of the table.

The *supper table* is arranged similarly to the breakfast table.

The Dinner Table.—The dinner table is usually laid for courses.

First.—Soup and rolls, croutons or baked crackers.

Second.—Meat, potatoes and vegetables.

Third.—Dessert.

Arrange the cloths, knives and forks, etc., as directed for the breakfast table. Place at the right of each knife a soupspoon, and a teaspoon or two, if needed.

For the first course, place a ladle with handle at the right, in front of the one who serves the soup, and hot plates at the left.

Soup should be dipped away, not toward, the one who serves it, and the same rule holds in eating it. Sip it quietly from the side of the spoon.

After the soup course is finished, remove the plates by taking them singly in each hand, or on a tray. Never pile soiled dishes to carry away, since it is not pleasing to see and it makes double work in scraping the dishes before they are washed.

The meat and plates for the second course may be arranged as for the breakfast table. After the second course remove everything but the dessertspoons and the tumblers. Pass to the left of each person and scrape off the crumbs, using a tray and a knife, which is cleaner and more thorough than a brush. Place the dessert in front of the one who is to serve it, with the plates or saucers at the left.

General Directions.—When the waiter passes the food to each person it should be passed on the left side of the person. In placing a dish in front of a person the waiter should stand at the person's right. Dishes should be removed from the right side.

Place everything straight upon the table.

Turn no dishes upside down.

In setting the table try not to forget anything. Remember that care in setting a table trains the eye and hand and contributes much to the comfort of a household.

Time Table for Cooking Vegetables.

Potatoes, boiled, thirty minutes.

Potatoes, baked, forty-five minutes.

Sweet potatoes, boiled, forty-five minutes; baked, one hour.

Squash, boiled, twenty-five minutes.

Squash, baked, forty-five minutes.

Green peas, boiled, twenty to forty minutes.

Shelled beans, boiled, one-half to one hour.

String beans, boiled, two to three hours.

Green corn, boiled, one-half hour.

Asparagus, fifteen to thirty minutes.

Spinach, one to two hours.

Tomatoes (fresh), thirty minutes.

Tomatoes (canned), fifteen minutes.

Cabbage, forty-five minutes to two hours.

Cauliflower, one to two hours.

Onions, one to two hours.

Beets, one to three hours.

Turnips, forty-five minutes to one hour.

Parsnips, forty-five minutes to one hour.

Carrots forty-five minutes.

Kitchen Weights and Measures.

Two and one-half teaspoonfuls, one tablespoonful.

Four tablespoonfuls, one wineglassful.

Two wineglassfuls, one gill.

Two gills, one teacupful.

Two teacupfuls, one pint.

Four teaspoonfuls salt, one ounce.

One and one-half tablespoonfuls sugar, one ounce.

Two tablespoonfuls flour, one ounce.

Two cups sugar, one pound.

One scant quart flour, one pound.

Ten eggs, one pound.

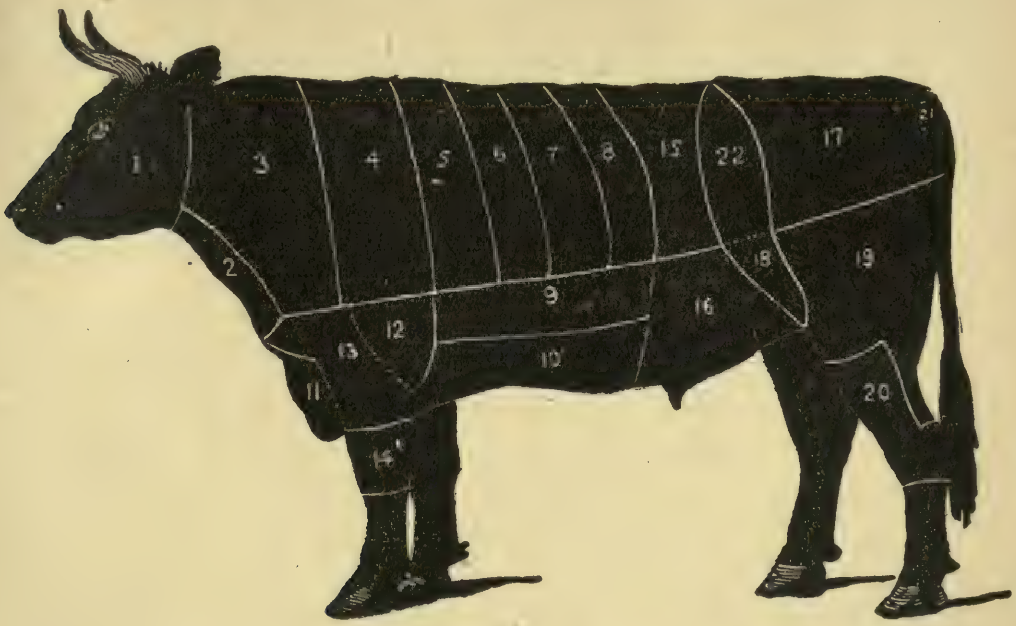
Two cups butter, one pound.

The Cellar and Store Room.

Vegetables will keep best on a stone floor if the air be excluded; meat in a cold dry place where the air is freely admitted; sugar and sweetmeats require a dry place; so does salt; dried meats, hams, bacons and tongues the same. All sorts of seeds for puddings, such as rice, etc., should be kept closely covered to preserve them from insects, but if kept long that will not be sufficient, unless they be occasionally sifted. Apples and pears should be laid upon very clean and dry straw to prevent a musty taste, nor should they be exposed to either light or air. They should be arranged singly in rows, without touching each other, and should be often inspected, both to wipe them if damp, and to reject those which may appear to be getting rotten. The larger sort of pears should be tied up by the stem. Apples may also be preserved in excellent condition for a long period by being packed in large barrels with dry sand, but require to be used immediately they are taken out.

CUTS OF MEATS AND THEIR USES

Every housekeeper, in fact, every one who has marketing to do, should know something of the cuts of all common meats and the most desirable way each can be prepared for the table. In the illustrations below are shown the location of these cuts. The names may vary somewhat in different sections.



Beef.

1. Head. Not used for food.
2. Sticking piece. Soups, beef-tea, stews, corning.
3. Neck. Soups, stews, beef-tea, boiling, corning.
4. Second and third chuck. Brown stews, braising, steaks, poorer roasts.
5. First chuck. Roasts.
6. First cut, standing ribs. Roasts.
7. Middle cut, ribs. Roasts.
8. Back ribs. Roasts.
9. Plate (no bones). Stews, soups, corning.
10. Brisket. Stews, brown stews, soups, corning.
11. Butt end of brisket. Soups, stews, corning.
12. Bolar (no bones). Corning, cheap roasts.
13. Bony end of shoulders. Soups.
14. Shin. Soups.
15. Loin (including tenderloin and sirloin). Roasts and steaks.
16. Flank or skirt. Rolled steaks, braising, boiling, corning.
17. Rump. Roasts and steaks. Meat to be cut across the grain.
18. Veiny piece. Stews, soups.
19. Round. Stews, beef-tea, poorer steaks.
20. Leg. Soups and stews.
21. Tail. Soups.
22. Pin-bone. Roasts.

The bones, gristle, tendons and other gelatinous portions are all excellent for making soup stock.

Mutton.

1. Shoulder. Boiling.
2. Breast. Roast, stews, chops.
3. Loin. Best end used for roasts, chops.
4. Neck. Best end, cutlets, stews, pies.
5. Neck. Scrag end, stewing pieces.
6. Head. Not used.
7. Loin. Roasts, chops.
8. Leg. Roasts, boiling.

The Kitchen.

The kitchen arrangements will depend upon many conditions, as size, shape and means of owner. But every kitchen can always be kept neat and tidy and supplied with a stove or range and usual cooking utensils. These we need not describe here. Only a few hints or things which may be overlooked will be needed here.

Since American enterprise has succeeded in supplying cheap time-keepers of reliable performance, every kitchen should include a clock in its outfit. Having learned from cook books and personal experiment the average length of time required to cook the usual meats, poultry, vegetables, etc., make a list of these and hang it up in some convenient place in your kitchen. You will find it of great aid. It will be a helpful supplement to the time-table just given.

The kitchen utensils should include, as useful additions, a small brush for cleaning vegetables which are cooked in their skins, as potatoes and beets; a pair of sharp-pointed scissors for opening fish, small birds, etc.; a wall pincushion containing, besides pins and needles, a large darning-needle for sewing-up poultry; a bag with a thimble, coarse thread, soft cotton for the darning-needle, twine, and narrow strips of muslin for tying up bunches of asparagus ready for cooking; a coarsely crocheted or netted bag for boiling cauliflower; several small boards to set hot pots and pans on, while dishing their contents, and a linked chain dishcloth for scouring the inside of pots and pans when they have been used to cook any article that sticks.

All cooking utensils should be kept free from soot, as less fire is required to boil the contents of a bright, clean saucepan or kettle. Should they have been neglected and have become very black, rub them with a flannel rag dipped first in oil, then in powdered brick, and polish with a dry flannel and a little more brickdust. All pots and pans are easier to wash if a little hot water is poured into them when their contents are emptied out, they being then placed on the rack at the back of the stove or on the hearth until it is convenient to wash them.

Silver should always be washed in clean, hot water, as soap dulls the polish. In washing the dishes, take the glasses first, next the silver, then such dishes as are not greasy, and, finally, the greasy dishes—these are best washed in two waters. Never let steel knives lie in water, as this discolors and loosens the handles. Pouring hot water on them is likely to have the same effect. Always have two cloths for cleaning knives; wet the first with water, dip into brickdust or fine ashes, and rub off all spots; polish with a dry cloth with a little of the dust; then wipe on a clean, dry towel.

It is best to have two sets of tea towels; one set going into the wash each week, and being ironed and, if needed, darned. Close attention should be given to the sink. It should be rinsed out whenever soiled, and when the day's work is done should be thoroughly flushed with clean hot water, so as to wash from the drainpipe trap any impurities which may have lodged there.

OUTSIDE THE KITCHEN

The kitchen, while the humblest, is the most important section of the household, and we have accordingly given ample space to its greatly varied culinary products, and have also spoken of the etiquette and management of the dining-room, which comes next to it in importance. But the duties of family life are by no means confined to these two apartments. The remainder of the house demands its round of daily labors. And here ornament needs to be considered as well as utility. It is here the family spends its hours of recreation, enjoyment, and repose; here many of its social duties are performed; here art and comfort join hands with usefulness and necessity, and it is to the demands of the household at large that our attention must now be directed.

The labors to be performed comprise sweeping, cleaning, the daily care of sleeping apartments, attention to the many small articles of adornment and utility; to clothing,

pictures, books, and furniture; to washing, mending, and a multitude of duties of which every day brings a new list. Let us, for example, rapidly review the ordinary weekly duties in a well-managed household, but one limited to a single maid, engaged for general housework.

Diary of a Week's Work.

On *Monday* the maid is expected to devote the morning to the heavy labor of washing; rising early, and getting the day's labors well under way before the breakfast hour. She will have, besides, the meals to attend to, but these are necessarily made simple and expeditious on that day, the mistress of the household usually finding it necessary to assist in the cooking and dishwashing.

Care should be taken to choose a plain dinner—steaks or chops, potatoes, and some ready-made dessert. The afternoon is occupied in finishing the washing, hanging out the clothes, and getting the tea, which must be a meal easily cooked; for the "tidying up" of the kitchen is yet to be done before the girl can rest. It will be a great assistance, in places where the visiting is sufficiently informal to permit it, if some member of the family open the door to callers on busy days.

Tuesday, by general consent, is assigned to the work of ironing; and here it will usually be necessary for the mistress to "lend a hand," and aid in clear-starching and ironing the fine clothing.

Wednesday is devoted to baking part of the cake, bread, and pies that will be needed during the week. In this work the mistress helps by washing the currants, stoning the raisins, beating the eggs, and making the light pastry. Often a lady who has a taste for cooking makes all the desserts, cakes, and pies. She should never consider it extravagant to supply herself with the best cooking utensils—egg-beaters, sugar-sifters, double-boilers, etc., and, if a good housekeeper, she will find both pride and pleasure in her jars of home-made pickles and preserves.

Thursday the maid must sweep the house thoroughly, for this work, if the carpets are heavy, requires strength. The mistress then dusts room after room, and, last of all, the servant follows with step-ladder to wipe off mirrors and windows. This is morning work, for the Thursday afternoon out for the maid is an established institution.

Friday is commonly occupied in general house-cleaning: scrubbing the floors, cleaning the brasses and silver, scouring the knives, and putting linen-closets and drawers in order.

Saturday is filled with baking bread and cake, perhaps with cleaning the yard or other out-of-door work, and in some households with preparing the Sunday dinner; and the toil of the week closes with a thoroughly swept and orderly house, a clean kitchen, and all the cooking done except the meat and vegetables for the Sunday dinner.

Of course the routine given above will not suit all families; many persons may prefer to make a different apportionment of their work; but whatever the system fixed upon may be, it should be rigidly carried out, and the maid should receive all the help in her manifold duties that punctuality and order bestow.

Under the most favorable circumstances it is a credit to any mistress to carry on the work of a house through the week, with three meals daily, and to accomplish it she must be capable of doing much of the light work herself and be careful to secure a strong and willing maid servant.

Sweeping and Cleaning.

When preparing to sweep a room, it is important to begin by dusting all the bric-a-brac and carrying it to a place of safety. The smaller articles can be placed in a wide shallow basket kept expressly for this purpose, or on a tray. Next, with a soft cheese-cloth or other duster and a whisk, clean carefully all the upholstered furniture; carrying out the small articles, and covering the larger ones with dusting sheets. The glass globes of gas fixtures must be washed in warm, soapy water, and rinsed in cold water, in which a little whiting has been dissolved. Shake the window curtains and fold them up as high as you can reach; pin them there, taking care not to tear them.

dust the shades with a feather brush and roll them up as high as they will go.

Brush down the walls, carefully dust the picture frames, and then begin your sweeping. Use a whisk to rid the corners and the edges of the carpet of dust, then gently, but with a steady stroke, sweep all the dirt into the middle of the room, and take it up in a dustpan. Repeat this operation to secure any dust that may have blown back. Should the carpet be very dusty, moist tea leaves or Indian meal, scattered over the floor before beginning to sweep, will gather up most of the fine dust and prevent its rising and settling on the walls, etc. It freshens and cleans a carpet wonderfully to wipe it thoroughly with a woolen cloth wrung out of water mixed with household ammonia.

Ink stains in the carpet may be removed with salt. If they have dried, slightly moisten the salt with water, scatter it over the stains, and keep gently brushing it back and forth until it is quite black, substitute more salt, and so continue until all the ink is drawn out of the carpet and absorbed by the salt. If the ink is freshly spilled, you need not dampen your salt.

Should your window panes need washing in freezingly cold weather, it is best to do it with a soft cloth dipped in alcohol; at other times a little whiting dissolved in the water adds to the brilliant transparency of the glass. In all cases polish with old newspapers. Having attended to your windows, carefully dust again the walls, pictures, gas-fixtures, and all cornices and moldings; draw down your shades, unpin and drape your curtains; fold up the dust sheets so as to gather up all the dust that has settled on them, and carry them from the room, which is ready now to be put in order.

If you burn lamps, keep them scrupulously clean. Wicks soaked in strong vinegar and dried before being used, will not smoke. Two or three times a year the part of the lamp containing the wick should be boiled in water in which washing soda has been dissolved; this will improve the quality of the light and obviate the danger of an explosion.

Nickel-plated lamps must never be washed with soap, as this spoils the polish and makes them look like pewter. Wipe them, instead, with a soft cloth dipped in vinegar. Lamps are more satisfactory when attended to every day.

Cleanliness About the House.

It is very important that beds are properly aired every day. The most effectual way to do this is to throw the clothes over a chair, and lift the mattress partly over the footboard. If a feather bed is used, pull it off upon a chair. Then open the windows and door so that a current of air can pass through the room, and let it remain so for several hours. Beds thus aired are always healthful, and will induce sound sleep in their occupants. Each member of the family should be taught to do this daily, boys as well as girls. They will reap the benefit of it through their lives, and be sure to have their children trained in the same way.

A bed that is aired only occasionally will contract impurities from the body and cannot be fresh and sweet. Some persons hang the pillows out of the window, and this is an excellent plan if the dust is first brushed off the sill.

"Attend," says a wise French writer, "as much to neatness as you do to economy. Accustom girls never to suffer anything about them to be unclean or in disorder; lead them to notice the slightest derangement in a house; say to them that nothing contributes more to economy and neatness than keeping things in their proper place. This may seem trifling, yet it leads to very important consequences; for then when anything is wanted there will be no difficulty in finding it, and when it is done with it will be returned to the place from which it was taken. This exact order forms the most essential part of neatness. For instance, a dish will not be soiled or broken if it is put in its proper place as soon as it has been used. The carefulness which makes us place things in order makes us keep them clean. Joined to all these advantages is that of giving to domestics a habit of neatness and activity by obliging them to place things in order and keep them clean."

Dust is a constant enemy of domestic comfort, and is a great destroyer of furniture. Inhaled into the lungs it becomes one of the sources of disease. Miss Nightingale remarks, with great truth: "Dusting in these days means nothing but flapping the dust from one part of a room to another, with doors and windows closed." A damp but not wet duster will alone remove dust without scattering it.

Causes of Unwholesomeness.

The healthiness or unhealthiness of a house depends greatly upon its degree of cleanliness. Dirty houses are always more or less unwholesome. In country places care should be taken that no puddles of dirty water remain close to the house, as they not only render the air damp, but cause much dirt to be brought in on the feet. Slops of dirty water, tea-leaves, coffee-grounds, etc., should never be thrown out near the house, all decaying vegetable and animal matter being injurious. Cabbage leaves, potato and apple-parings, and other waste vegetable matters, should never be thrown into the dust-bin. It is far the safest plan to burn them, which can always be done if they are first dried by throwing them at the back of the fire or in the ash-pit.

The inside of a house becomes unclean not only from the dust carried in by the air and the dirt brought in by the feet, but from the odor given out by our skin and with the breath. This odor is absorbed by all porous substances, as the walls, floors, and ceilings, and gives rise to that close, unwholesome smell which is present in all unclean houses, especially such as are overcrowded. No house with such a smell can possibly be a healthy place to live in. This animal effluvium is taken up by some substances much more readily than others. Walls that are covered with paper smell much more offensively than those that are painted. And in rooms where one paper has been pasted over another the whole thickness of paper may absorb it. Painted or lime-washed walls are much to be preferred to paper walls for crowded dwellings and for sleeping-rooms.

Woolen garments, carpets, and curtains absorb such odors freely, and give them out for a long time. Rough wooden floors also take them up, and consequently require frequent washing. For this reason smoothed, waxed, or painted floors are preferable to rough wooden ones.

The wholesomeness of a dwelling is much increased by frequently whitewashing such parts of it as can be treated in this manner—the cellar, storeroom, etc. The dirt and old whitewash should be first washed away with a brush and abundance of clean water.

Care of Floors.

Floors should not be scrubbed too frequently. Once a week is generally sufficient. In damp weather wet floors dry very slowly, and the house remains damp and cold for a considerable time. It is better, in all cases, to defer the scrubbing even for a week than to wet the floors on a damp and rainy day. In cases of illness this is particularly important. It should be a fixed rule that floors, particularly those of sleeping-rooms, are to be scrubbed only on dry days.

Bones, old shoes and boots, dirty woolen rags, and pieces of carpet are often allowed to lie about the house. These render the air impure, and consequently unwholesome, are exceedingly apt to become mouldy, harbor vermin, serve as breeding-places for the clothes-moth, and retain tenaciously any infection to which they may have been exposed. Such things should always be got rid of; if not sold at once, they had better be given away, if of any value, or else burnt, rather than be kept to render the air of the house impure.

Wash as often as convenient. Dirty clothes put by for weeks are more difficult to clean the longer they remain dirty; they acquire a permanent bad color, and in damp places are apt to become mildewed and rotten.

Remove all stains as soon as possible; leave nothing long enough to fix itself thoroughly to the cloth; wash out grease, gravy, fruit-stains, etc., before putting anything to one side. Fruit-stains yield readily to bleaching-powder, especially if, after being put on, it is moistened with a drop of some acid, as vinegar or lemon; but neither acids nor bleaching-powder should be used with

colored things. Ink-stains should never be put into soapy or soda water or lye, as they directly become iron-molds; but they should be instantly wetted with clean water, and may be at once removed by the application of a little salt of lemon or oxalic acid, which should be washed out immediately.

HOUSEHOLD UTILITIES

It is proposed, in the present section of our subject, to give practical advice on various questions of household utility, such as the care of clothing, the cleaning of soiled fabrics, the removal of stains, and other matters of importance which come up almost daily in the experience of housekeepers. Perfumes constitute another matter of importance, and useful information about various other odds and ends of daily life experience is given, suggestions which cannot fail to be of great utility to all who have the care of a family on their hands. In life within doors endless questions of what and how to do under certain circumstances arise, and it is with these exigencies of daily life that we shall here deal.

Care of Furs, Feathers and Woolen Goods.

Many things and substances are recommended for the destruction of injurious insects. Pliny says that the Romans used citron to preserve their woolen garments from moths. We have found that the insects which injure furs, feathers, and woolen goods may be destroyed by the Indian chestnut, cloves, walnut leaves, or common salt. Still more useful as preservatives are cedar chips, pepper, and camphor (in large pieces, for when broken it loses strength).

Whatever the remedy selected, it is necessary in the first place to carefully shake, beat and brush the furs (against the grain), and all other articles which are to be put away when the season is over. They should then be sprinkled with pepper or camphor, and wrapped in a cloth which has been washed in lye water. Close the parcel careully, and place in a chest into which some insect powder has been sprinkled. It is well to put away feathers in empty cigar boxes.

If one owns a cedar chest, or has closets which are wainscoted with cedar, it is sufficient to hang up the articles after having well brushed and shaken them.

Other methods may be employed to get rid of moths. A liquor of one quart of alcohol and the same quantity of essence of turpentine, and sixty-five grammes of camphor, is sometimes used. This should be kept in an earthenware jug, and well shaken before using. When the winter garments are put away, soak pieces of blotting paper in the liquid, and scatter among the furs and flannels, which should be rolled up in white cloths. Place one layer at the bottom, one above the article, and one at each side.

If one has no such chest, then, after having shaken and brushed the articles, fold them separately in linen paper, sprinkle with pepper and camphor, roll each parcel in newspaper, do the package up in white cloth, and hang in a closet or dark room.

Clean furs by rubbing them against the grain with heated bran. Use magnesia for white furs.

Cleaning of Lace.

Fine laces should be washed as seldom as possible; but when it is necessary, most women prefer to have them washed under their own eyes. Make hot soap suds with rain water and glycerine soap. The laces, after having been rolled on a glass bottle under a band of linen, must be put in the suds and remain there for twelve hours. Renew the soap suds three times, plunge the bottle into soft and clear water, and take it out immediately. The soap which remains serves to give some stifiness to the lace when pressed by a hot iron. Pin each point down under a fine muslin, and iron on the wrong side. When all is finished, raise each flower by a suitable pointed instrument.

Laces may be bleached by being exposed to the sunlight in soap suds. The points are afterward dried on a cloth to which they are pinned. They are then rubbed carefully

by the aid of a sponge dipped in soap suds of glycerine soap. First clean one side, and then the other. Rinse in clear water, in which a little alum is dissolved, to remove the soap.

A little rice water should be passed over the wrong side of the lace with a sponge; then it is to be ironed, and when finished the flowers should be picked out as in the above method. If the lace is not very much soiled, it can be cleaned with bread crumbs.

As for cream-colored laces, they should be boiled for one hour in soapy bluing water, then taken out and the operation repeated twice, always in fresh water. The third time there should be no bluing in the water, and it should not be rinsed. The lace should afterward be put in gum water, with a little brandy and alum dissolved in it. Then powder lightly with sulphur flour and iron while damp.

Valenciennes should be folded together in a regular length, sewed in a sack of fine white linen, and soaked in olive oil for twelve hours. Afterward put some sliced pure soap in water and boil the sack containing the lace for fifteen minutes. Rinse well, dip in a thin rice water, then rip open the sack and pin down the lace to dry. Iron it under a muslin cloth.

Black laces should also be folded in a short package and kept in place by stitching at the top, in the middle, and at the bottom. Dip the lace in beer and roll it with the hands, not rubbing too much to clean it. When it is taken out of the beer, press it between the hands without wringing, then roll it in a cloth. Iron it after it has been partly dried, according to the desired stiffness. To iron it, stretch it on a thick flannel, and let it remain there. Cover it with a thin piece of muslin to prevent the iron from making it glossy.

When gowns trimmed with lace are put away, cover the lace with silver paper.

To cleanse silver laces and braids, put them in a sack of white linen, which dip into one pint of water, adding sixty grams of soap. Boil well, and rinse in cold water. Apply a little spirits of wine to the tarnished places. H. C. Pros.

Cleaning Woolen Goods.

Clean rose-colored cashmere by washing in cold soapsuds. If you attempt to put dye in the water, the material will be spoiled. Rinse well in cold water, and dry in the shade.

To clean white serge, use a decoction of soapwort roots. The gown when washed will be white and soft to the touch. Soap hardens stuff goods, and makes them yellow.

Knitted or crocheted garments should be washed in the following manner: cut one pound of soap in thin slices, and melt in a little water until it has the consistency of jelly. When the preparation has cooled, beat it up with the hand, and add three spoonfuls of grated stag's horn. Wash the whole material in this mixture, and rinse well in cold water. If necessary, dip the articles a second time in salt water to fix the color. Place before the fire; stir frequently in order to let the dampness evaporate; be sure not to stretch the articles out to dry.

To clean a faded black cashmere, rub it width by width with a sponge soaked in a solution of alcohol and ammonia, equal parts, diluted with hot water.

Wash merinos and cashmeres in warm water into which Irish potatoes have been scraped. Rinse in good soft water. These materials should not be wrung out. They should be spread smoothly on a line where they may drip, and should be allowed to become partly dry before ironing.

Black merinos, cloaks, gentlemen's clothes, or woolen goods generally, may be cleaned with carbonate of ammonia, which must be poured into boiling water and allowed to become cold. Meanwhile, brush the stuff thoroughly with a hard brush, laying it upon a large newspaper, and brushing both sides, where possible.

Then take a large piece of black cloth or other material, dip it into the liquid, and wash the stuff well. If the fabric be cloth, care must be taken to wash it the *right way*, so as to keep it *smooth*. When washed, fold the material in half, and place it in a clean towel, laying one piece over the other in case the garment has been taken to pieces. Iron the *wrong side*, laying the stuff on a thickly folded blanket or sheet, with a thin sheet of paper, or other thin material, over

the blanket or sheet. Iron each piece on the wrong side until quite dry. Then fold the pieces, but be careful not to fold so as to crease them, especially cloth. Gentlemen's clothes can be cleaned in this way without taking to pieces, or ironing, unless convenient. Vest and coat collars are easily renovated, and grease spots and white seams removed.

Colored Fabrics.

Nearly all colored fabrics stain the water used to clean them, and that without losing their own brightness in any way. No article of a different color should be plunged into a wash or rinse so stained, and no colored article should be rinsed in a blued lather. Scarlet is particularly likely to color wash water.

Colors are often improved by the use of certain substances in the wash or rinse. Sugar of lead has the credit of fixing all colors when first cleaned, and may be used with those likely to run. To brighten colors, mix some ox-gall with the water. Of course the quantity must be regulated by the quantity of suds in the wash and rinse. For buff and cream-colored alpaca or cashmere, mix in the wash and rinse a small quantity of friar's balsam for one skirt. For a dress of black materials, use a little ammonia in the wash and rinse. For violet, also put ammonia, or a small quantity of soda, in the rinsing water; but it must be borne in mind that some violets and mauves fade in soda. For green, use vinegar in the rinse, in the proportion of two tablespoonfuls of vinegar to a quart of rinse. For blue, to one dress, put a good handful of common salt in the rinse. For brown and gray, use ox-gall. For white, blue the water with laundry blue.

Blankets may be similarly dealt with. Pull them out well, while wet, in both directions, two persons pulling. When half dry it is a good plan to take them off the line and pull them again; and when quite dry, give them a little more pulling out. This keeps them open and soft. Never use soda to them, and never rinse them in plain water or rub on soap.

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Flannels.

It is very important, in washing flannels to prevent shrinkage. The articles should be *washed* and *rinsed* in water of the same temperature, and not allowed to cool between. Do not rub soap on the goods. Use a strong suds, about as hot as the hands can bear; rub through two soapy waters; wring out and rinse in plenty of warm, clean water; then in another water of same temperature, blued a little. Wring, shake well, and hang up, but not in a freezing air; better dry them in the house, unless a warm sun is shining. Flannels should dry quickly.

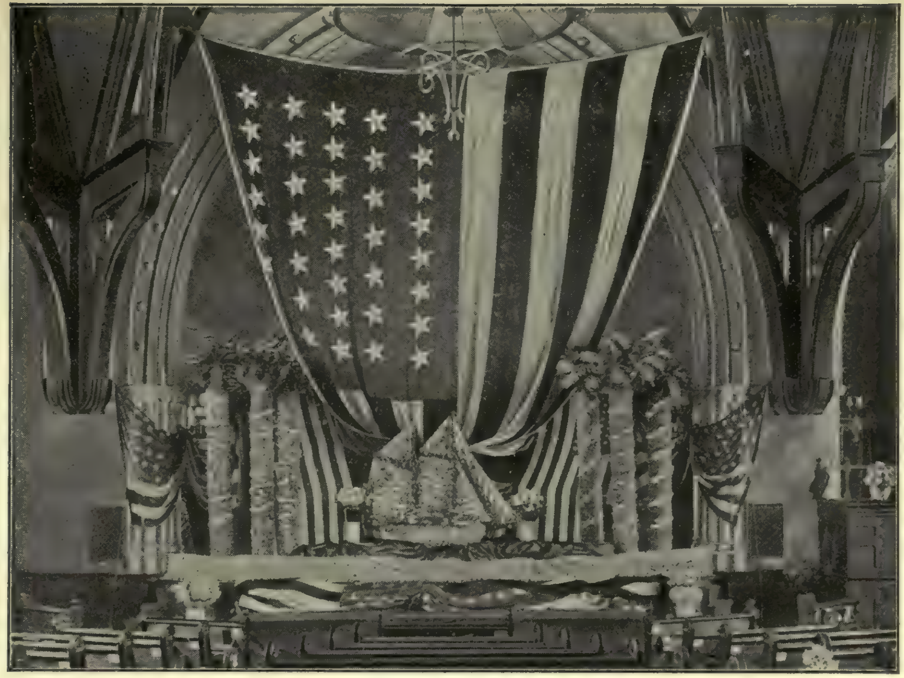
Colored flannels should not be washed in the water after white clothes, or when dry they will be found covered with lint; they had better be washed in a separate water. Blue flannel requires bran water without soap. When rinsing, throw a handful of salt in the water to preserve the color. Flannels that have become yellow from bad washing, may be whitened by soaking them in a lather made of a quarter pound of soft soap, two tablespoonfuls of powdered borax, and the same quantity of carbonate of ammonia, dissolved in five or six gallons of water.

Care of Muslins

Muslin dresses, even of the most delicate colors, can be cleaned in ten minutes or a quarter of an hour, without losing their color. Melt half a pound of soap in a gallon of water; empty this into a washing tub; place nearby two other large tubs of clean water, and stir in one a quart of bran. Put the muslin in the soap, turn it over, and knead it for a few minutes; squeeze it out well, and rinse for some minutes in the bran, and for two minutes more in clear water. Then hang between two lines. In the case of a colored pattern on a white ground do not use blue.

In starching colored muslins use white starch, made with boiling water. Dip the dress in this, and, after drying, rinse quickly in clean water. Sprinkle and roll, and afterwards iron with very hot irons.

For white muslins, lace curtains, etc., proceed as above, but use blue in the starch.



PATRIOTIC DECORATIONS

Decorations used to instil patriotism are the most commendable of the many public occasions.—Children's Days, Commencements and national holidays are the most popular. Flags and bunting, banks of daisies, a "Ship of State" and floral columns are seen in this illustration.

DECORATIONS FOR A WEDDING

This is an interesting view of elaborate designs, in arches and festoons. The green and white in the arches and in the pulpit decorations are easily procured and arranged.

Morning cambric dresses may be cleaned in the same way as muslins, but may need some rubbing. Chintz may be cleaned in the same manner.

There are certain advantages in this process, which is so rapid that the colors have not time to run, the fabric is not rubbed or strained, and the work is done so quickly as greatly to reduce the labor involved.

Silks.

Lay the silk smoothly on a clean board, rub soap upon it, and wipe it with a piece of velvet. Never brush it; the brush ruins it. When it has been in this manner cleansed from grease and dirt, it should be washed on both sides with clean cold water. A little alum in this water will prevent the colors from spreading. Should there be any patches of grease upon the silk, they should be removed with ammonia or a little camphine and alcohol. Folding or wringing silk when wet must be carefully avoided, since creases made in wet silk never disappear; and, in like manner, *hot suds* must not be used for washing silk, as it will in most instances remove the colors.

Silks are easily cleaned if one knows how to work carefully. Mix the following well together: Fifty grams of honey, as much soft soap, one gill of brandy. Rip the gown, place in cold water, spread on a table, and rub well with a brush dipped in the mixture. Rinse three times in a pail of water, into which sixty-five grams of gum have been dissolved. Let the garment drip without being wrung, and iron on the wrong side.

Another recipe: Grate five Irish potatoes in clear cold water. If the silk is thin, slice the potatoes instead of grating. Wash them well before grating or slicing. Let the prepared water stand for twenty-four hours before using. Then strain the liquid. Dip the silk in without rumpling it; spread it on a table, wipe both sides with a clean towel, and iron on the wrong side.

Grease stains may be removed either with chalk, magnesia, or ether, or with the yolk of an egg and water. Clean white brocaded silk with bread crumbs. Plain silk requires the following process: Dissolve soft soap in water as hot as the hands can bear; rub the silk between the hands in the soapy water; rinse in warm water, and dry by pinning on a cloth.

Nothing is so good for black silk, and, in fact, for many materials, as beef gall. Throw the gall-bladder into as much boiling water as you care to use. Spread the material on a table, and with a sponge dipped in the liquid clean the silk on both sides. Rinse in clear water, still on the table, on both sides with a sponge. Dissolve a little gum arabic or gelatine in the water, moisten the sponge with it, and pass it over the wrong side of the silk. Pin the silk on a cloth to dry it.

A good way of removing grease stains from black silk is to rub them very vigorously with a piece of brown wrapping paper.

Velvets.

Velvet garments which have been stained, or worn, or have grown glossy, may be renovated so as to look new. The garment must, of course, be ripped, breadth by breadth, piece by piece. Then put burning coals in a chafing dish, and place on this dish a platter of thick brass. When it is very hot, cover it with a thickly folded cloth dampened in boiling water. Spread on this cloth the velvet, wrong side out. Do not be frightened if you see a black vapor arise. Pass a brush very lightly over the velvet. Let it dry stretched smoothly on a table.

When the velvet has been crushed, turn it wrong side out, and hold it above boiling water, exposed to the vapor. Brush it against the grain.

Before putting away gowns, mantles, plush or velvet jackets, the dust should be removed. To do this, spread some fine white sand over the material. Brush it until the last grain of sand has disappeared. If mud stains are on the garment, dilute beef gall and a little spirits of wine in boiling water. Wet a soft brush in the mixture, and rub the stain, repeating as often as necessary. Apply to the back of the material a thin solution of gum.

Veils, Hats, Etc.

Wash faded ribbons in cold soapsuds. Rinse, shake out, spread on the ironing-board, and cover with muslin, ironing while damp.

Women in mourning frequently discard long crape veils and trimmings, not because they are ruined by the rain, but because they do not know how to care properly for this material when it is wet. It should be dried immediately, spreading it out, but not near the fire. If it is stained with mud, clean it with cold water, and dry away from the fire, air, and sunshine. English crape, when it has become limp, should be dampened with brandy, then rolled on a roller. Moisten it at each turn, and evenly throughout. Milk may also be used to dampen crape and to restore its color, but the crape should be carefully sponged afterward with water.

Black thread stockings may be washed as follows: Never use soap, but a suds made of a teacupful of bran inclosed in a muslin bag, thrown into warm water, and well stirred. First wash the stockings in this preparation. On taking them out of the water, roll them in a towel, pressing strongly, and dry quickly near the fire, not in the air.

If this precaution be taken, the stockings will retain a fine black color, and never grow dingy. If they are neglected and become rusty, the color can be restored by boiling them in one quart of water, into which a few chips of logwood have been thrown.

Felt hats which have been wet should be brushed before drying. Rip off the trimmings; begin brushing at the border, and continue turning, always on the same side, until the center is reached at the very top. Place the hat on a mold and let it dry before putting it away. It will be as fine and beautiful as when new.

In putting gowns away for the season, wrap them in blue paper tightly sealed. White silk skirts should be placed in a second covering of muslin, and the bodices put away in cases or boxes. Fold the trains their full length.

To cleanse the collars of garments, dissolve one part salt in four of alcohol. Apply with a sponge and rub well.

Cloth, serge, felt hats, may all be cleansed by dipping a hard brush, which has short hairs, into spirits of ammonia. Rub until the grease spots disappear.

Laundry Work.

In washing clothes, dissolve pipe-clay in the water, a cent's worth to four gallons. It will be found to clean clothing with halt the labor, and considerably less soap, while the colors of the clothes are improved. Petroleum dissolved in the water is also of great utility, saving much of the labor and soap and yielding superior results.

Chintzes should always be washed when the weather is dry and sufficiently warm not to freeze them. If necessary to wash them in wet or very cold weather, it is better to dry by the kitchen fire than to run the risk of spoiling the colors by outdoor drying.

To Wash Chenille Curtains.—Two ounces ether sulphate, two ounces borax, two ounces soda, one cake ivory soap; shave soap and let dissolve in warm water, then add all the ingredients to sufficient warm water to wash curtains in. Do not rub on board, but dash up and down until they are thoroughly clean. Do not wring them, but squeeze out of the water, and hang lengthwise in a shady place. Then take a whisk broom and brush until dry. Do not go near the fire, as ether is a dangerous explosive.

To Clean Kid Gloves and Shoes.—An easy way to perform this is to stretch the glove in some way as on the open hand, and rub it carefully with moistened flannel, having first placed a little powdered soap on the flannel. After the dirt has been thus removed, the glove should be dried by rubbing with dry flannel.

To clean ladies' kid boots, dip a rag in almond oil and remove all the mud, drying as you go, and never leaving the leather moist. Polish with a clean rag and more oil. The dulness left by this process may be removed by rubbing with the palm of the hand. Kid may be both cleaned and preserved in this manner.

The Removal of Stains.

Ink stains on woolen goods and cloth may be removed with oxalic acid, diluted, or rubbed over with strong vinegar, so that it may not injure the stuff. This acid has, however, the disadvantage of being very

poisonous, and must be used with caution. Citric and tartaric acids, which are harmless, and answer the purpose as well, are to be preferred, especially as they may be used on the most delicate fabrics without any danger of injuring them. They may also be employed to remove marks of ink from books, as they do not injure printing-ink, into the composition of which iron does not enter.

Lemon juice, milk, the juice of ripe tomatoes, etc., are good for ink stains on white goods. If the ink be spilt on a carpet or table cover, the stain should immediately be rubbed with a moistened cloth, the rubbing being continued over and beyond the stain until the ink marks have disappeared. If this be done very promptly, the stain may be entirely removed. The work may be completed with a second wet cloth.

In case the color of the material is destroyed by an acid used in removing ink stains, or through accident, it may be restored by rubbing the spot with ammonia. In the case of varnish or paint stains, rub with benzine or turpentine. If the stain is old use chloroform, but be very careful in its use. To remove blood stains, saturate with petroleum and wash in hot water. Grease spots from dripping candles may be removed with cologne water.

Grease spots are the most disagreeable stains. They always spread, and are more offensive than others. Fortunately, there are many ways for getting rid of them.

Before attempting to remove stains from woolen goods, place on them a piece of absorbent paper, pass a hot iron over it, and then use ammonia and soapsuds. Chloroform is successfully used, and also a mixture of alcohol and ammonia. These spots may be also dampened with ammonia water, and ironed under a piece of white paper.

Rub the stain with chalk on the wrong side of the cloth, allowing it to remain on all day. Many persons keep the following preparation to remove stains whenever needed: Make a stiff paste of Fuller's earth and vinegar. Roll into a ball and dry it. To use it scrape the ball on the stain, which must first be moistened; allow it to dry, and then remove the stain with warm water.

Here are three formulæ for removing stains:

First. Essence of turpentine, very pure, twenty-six grams; alcohol at forty degrees, thirty-one grams; sulphuric ether, thirty-one grams; pour into the bottle, cork, and shake well. To use the mixture, place the material to be cleaned on a piece of thickly folded white cloth. Wet the stain thoroughly with the preparation, and rub lightly with a fine cloth. If the stain is an old one, warm the material.

Second. Mix ammonia and ether and alcohol, in equal parts, thoroughly; place on the stain a piece of blotting-paper; moisten with a sponge dipped in water, to make it more absorbent; wet it with the mixture, and rub the stain. It will disappear in an instant.

The following will remove a stain of any kind: Pour into a large-necked bottle two quarts of pure spring water; add a lump of ashes of old lees of wine, about the size of a nut, a lump of potash, two sliced lemons. Allow this to stand for twenty-four hours. Filter the liquid, and keep in well-corked bottles. When you wish to remove the stain, wet it with the preparation, then rub the spot with fresh water.

Marble and Furniture Polish.

A good marble polish is the following: Melt over a slow fire four ounces of white wax, and, while still warm, stir into it an equal weight of oil of turpentine. When these are fully combined, put the compound into a bottle or other vessel, which must be kept well corked when not in use. A little of the above put upon a piece of flannel and well rubbed upon the marble will bring the surface to a fine polish.

To polish furniture, prepare white wax and oil of turpentine as above directed. A small quantity applied with flannel or other woolen cloth, and well rubbed in, is excellent for mahogany and walnut. If a yellowish tint is desired for light-colored wood, put into the turpentine in advance a small quantity of quercitron, or dyer's oak, and let stand for two days. To give a reddish tinge, a little alkanet may be used in the same manner as the quercitron.

For another furniture polish take one a half ounces each of alcohol and butter of antimony, one-half ounce of muriatic acid, eight ounces of linseed oil, one-half pint of cider vinegar; mix these cold and apply with Canton flannel, then rub with dry Canton flannel.

Recipes for Cleaning.

Steps and Flag-stones.—Where there are large flights of stone steps and broad pavements of flag-stones, the process of cleaning is a tedious one. To clean with hearthstone, or caked whiting, as usual, gives a smeary appearance, and washes off with the first shower. The following preparation is preferable alike for its appearance and as a labor saving appliance, as it need be used but twice a week, washing being sufficient for the remaining days: Take a gallon of water, and color with stone-blue to a deep tint. Boil in this a pound of white size, and dissolve in the mixture a quarter pound of whiting and three cakes of pipe-clay, stirring well. Wash the steps rapidly with this solution, and finish with clean water in the usual way.

Damp Walls.—Damp walls may be dealt with in the following manner: Mix two quarts of tar with two ounces of kitchen fat, and boil together for a quarter of an hour. Then add some slaked lime and very finely pounded glass. The lime and glass must be in the proportion of two to one, and thoroughly mixed. Apply immediately, as the mixture soon sets and becomes hard. A coat an inch thick will usually quite overcome the dampness, though in extreme cases two coats may be necessary.

To Clean Soiled or Stained Furniture.—Use spirits of turpentine, and afterwards polish with linseed oil colored with alkanet root. If, however, the furniture is badly stained or inky, it should be washed with sour beer or vinegar, warm. Afterwards rub the stains with spirit of salts, which will remove them. The wood may then be polished, with linseed oil colored with alkanet root, or with beeswax, dissolved in turpentine, with a little copal varnish or resin added.

New mahogany may be given the dark tint of old by washing with various substances. Soap and water will darken somewhat, but oil is more efficacious; if a very dark tint is desired use lime water.

Paint may be cleaned with the following preparation: Mix one pound of soft soap, two ounces of pearlash, one pint of sand and one of table beer. Let these simmer together till fully incorporated, and use the mixture in the manner of soap.

Another cleaning mixture may be made by grating four potatoes to a pulp and mixing with a quart of water. After stirring, let the pulp settle and pour off the water. This must be applied with a sponge.

To Clean Decanters and Water-bottles.

When these, from containing hard water for a considerable time, have become coated in the interior with a deposit of carbonate of lime and other impurities, the easiest way is to use about a teaspoonful of hydrochloric acid, rinsing the bottle with it. It will be found that the instant the acid comes in contact with the deposit it removes it, a clear solution of chloride of calcium being formed. The bottle should then be rinsed in plenty of clean water. After a decanter has held port or other wines for a long period, a deposit of coloring matter will cover the interior surface of the glass. This may be easily cleaned off by a little sulphuric acid, in the manner above described.

Cleaning Copper Utensils.—These can be given a clean, bright surface by the use of nitric acid. The desired surface is thus obtained quickly and with little trouble. But there is the objection that a considerable quantity of nitrous fumes are given off, and these red vapors are at once extremely disagreeable, and very prejudicial to health. Their production may be prevented by adding a little solution of bichromate of potash to the dilute nitric acid. This is found to answer perfectly, the copper surface being made clean and bright, without disengagement of vapors.

To Clean and Brighten Brussels Carpets.—Take a fresh beef-gall, break it into a clean pan; pour one-half into a very clean bucket, and nearly fill it with lukewarm water; take a clean, coarse cloth, and, having brushed the carpet well, rub it hard with the cloth thoroughly wet with gall-water; do a small piece at a time; have ready a dry coarse cloth, and rub the carpet dry; so proceed until the whole carpet is cleaned. A few drops of carbonate of ammonia, in a small quantity of warm rain-

water, will change, if carefully applied, discolored spots upon carpets, and indeed all spots, whether produced by acids or alkalies. If one has the misfortune to have a carpet injured by whitewash, this will immediately restore it.

Another recipe for cleaning carpets is two and one-half bars Ivory soap, one half-pound powdered borax, one-fourth ounce glycerine; shave soap fine, put in four gallons soft water; heat till dissolved, then let cool enough to use.

Grease on a carpet, if not of long-standing, can be readily disposed of by washing the spot with hot soapsuds and borax—half an ounce of borax to a gallon of water. Use a clean cloth to wash it with, rinse in warm water, and wipe dry.

To Clean Paper-Hangings. Take small pieces of stale bread, about two days old, commence at the top of the room, and with the crust wipe lightly downward about half a yard at each stroke, till the upper part of the hangings is completely cleaned all around, and so continue until the whole is gone over. This operation, if carefully performed, will frequently make old paper look almost equal to new. Great caution must be used not to rub the paper hard, nor to attempt cleaning it the cross or horizontal way. The dirty part of the bread must each time be cut away, and the piece renewed as often as necessary.

To Extract Grease from Papered Walls.—Dip a piece of flannel in spirits of wine, rub the greasy spots gently once or twice, and the grease will disappear.

Oil-Marks on wall-paper, or the marks where inconsiderate people rest their heads, are a sore grief to good housekeepers, but they can be removed without much trouble. Take pipe-clay or fuller's earth and make it into a paste about as thick as rich cream with cold water; lay it on the stain gently, without rubbing it in; leave it on all night. It will be dry by morning, when it can be brushed off, and, unless an old stain, the grease-spots will have disappeared. If old, renew the application.

To Remove Stains in Tables.—Wash the surface with stale beer or vinegar; the stains may then be removed by rubbing them with a rag dipped in spirits of salts. To repolish, proceed as you would do with new work. If the work be not stained, wash the surface with clean spirits of turpentine, and repolish it with furniture oil.

To Clean Paint, smear it over with whiting mixed to the consistency of common paste in warm water. Rub the surface to be cleaned briskly, and wash off with pure, cold water. Grease spots will in this way be almost instantly removed, as well as other filth, and the paint will retain its brilliancy and beauty unimpaired.

Removal of Dry Putty.—The difficulty of removing hard putty from a window-sash can be obviated with great readiness by simply applying a piece of heated metal, such as a soldering-iron or other similar implement. When heated (but not red hot), the iron is to be passed slowly over the putty, thereby rendering the latter so soft that it can be cut or scraped off without difficulty.

To Clean Straw Matting.—Wash as seldom as possible, but when it is necessary to do so use salt and water. Salt prevents the matting from turning yellow. Dry as fast as you wash, and wash but a little at a time.

To Remove Mold from Fabrics.—Rub them over with butter, and then apply potash moistened in a little water, and rub the spot until all traces of it disappear; then wash in plenty of water to take out the potash; or the moldy spot may be wetted with yellow sulphide of ammonia, by which it will be immediately blackened. After a couple of minutes wash it off, and remove the black stain with cold, weak chlorohydric acid; then wash well with warmish water.

Cleansing Picture Frames. — Black walnut frames will become dull and rusty-looking. They may be renewed by first brushing thoroughly with a stiff brush to remove dust, and then applying pure linseed oil with a proper brush; in the absence of a brush, a piece of new bleached muslin will answer the purpose.

To Clean Mirrors, Looking-Glasses, Etc.—Take a soft sponge, wash it well in clean water, and squeeze it as dry as

possible; dip it into some spirits of wine and rub over the glass; then have some powder-blue tied up in a rag, dust it over your glass, and rub it lightly and quickly with a soft cloth; afterward finish with a silk handkerchief.

To Take Stains Out of Marble.—Mix unslaked lime in finest powder with the strongest soap-lye, pretty thick, and instantly with a painter's brush lay it on the whole of the marble. In two months' time wash it off perfectly clean; then have ready a fine thick lather of soft soap, boiled in soft water; dip a brush in it and scour the marble. This will, with very good rubbing, give a beautiful polish.

To Take Iron Stains Out of Marble.—An equal quantity of fresh spirits of vitriol and lemon-juice being mixed in a bottle, shake it well; wet the spots, and in a few minutes rub with soft linen till they disappear.

Marble can be nicely cleaned in the following manner: Pulverize a little bluestone, and mix with four ounces of whiting; add to these four ounces of soft soap and one ounce of soda, dissolved in a very little water. Boil this preparation over a slow fire fifteen minutes, stirring all the time. Lay it on the marble while hot with a clean brush. Let it remain half an hour; then wash off in clean suds, wipe dry, and polish by quick rubbing. If marble is smoked or soiled, either by bituminous coal or too free use of kindling wood, Spanish whiting with a piece of washing soda, rubbed together and wet with only enough water to moisten and make them into a paste, will remove the grease and smoke. Dip a piece of flannel in this preparation and rub the spots while the paste is quite moist. Leave the paste on for hours, and, if need be, remove it and renew with fresh paste. When the spots disappear, wash the place with clean hot soapsuds, wipe dry, and polish with chamois skin.

To Take Bruises Out of Furniture.—Wet the part with warm water; double a piece of brown paper five or six times, soak it and lay it on the place; apply on that a hot flat-iron till the moisture is evaporated. If the bruise be not gone, repeat the process. After two or three applications the dent or bruise will be raised level with the surface.

Lamp-Chimneys can be prevented from cracking, when exposed to the burning flame, by first placing them in a vessel of cold water and bringing this to a boil over the fire, then removing the vessel and allowing it to cool before taking out the cylinder.

To Remove Glass Stoppers.—When the stopper of a glass decanter is too tight, a cloth wet with hot water and applied to the neck will cause the glass to expand, and the stopper may be removed. In a phial the warmth of the finger may be sufficient.

Household Pests.

To Destroy Crickets or Roaches.—Put some strong snuff in the cracks and holes in which they hide. The parings of cucumbers will, if strewn about near their holes, drive them away. Roaches devour greedily flour paste, and die while eating it, if into half a pint of it, while hot, a dime's worth of phosphorus is stirred with a stick.

To Destroy Flies.—Take strong green tea, sweetened well, and set in saucers about the places where they are most numerous. To destroy them in this way is preferable to the use of fly-papers, which catch the insects alive, and cause them to die a slow death.

Rat Poison.—A tasteless, odorless, and infallible rat poison is made as follows: Mix carbonate of barytes, two ounces, with grease, one pound. It produces great thirst, consequently water must be set by it, for death takes place immediately after drinking, not giving them time to go back to their holes. Be sure no other animal can get at it, except rats and mice, for it is a most deadly poison.

Persian Insect Powder is an unfailing bed-bug poison. It is not poisonous, but none the less is sure death to all insects. It is blown with an insect gun into all cracks, crevices, and places where bugs can find an entrance. This has been tried and found to be efficacious in hundreds of instances. To wash bedsteads with coal oil will also clear them of bugs.

To Get Rid of Ants.—Wash your shelves down clean, and while damp rub fine salt

on them quite thick ; let it remain on them for some time, and red ants will disappear.

Another remedy for ants may be made of half a pound flour of sulphur and four ounces potash. Put them over the fire in an earthen pan till they dissolve and unite. When cold, beat them to a powder, put a little of this into water, and sprinkle the infested places. The ants will leave.

An Insect Remedy.—Dissolve two ounces of alum in three or four quarts of water, letting it remain over night, until the alum is thoroughly dissolved. Then apply it, boiling hot, with a brush, to every joint or crevice that is infested by ants, roaches, bed-bugs, etc. Brush all the cracks in the floor and mop-boards. Keep it boiling hot while using.

Rats and Mosquitoes.—A bottle of the oil of pennyroyal, left uncorked in a room at night, will dispose of mosquitoes. Not one will be found in the morning. Rats may be dealt with by mixing potash with meal and throwing it into their holes. If a rat or a mouse gets into the pantry, stuff into its hole a rag saturated with cayenne pepper. That pathway to the pantry will be deserted.

Other Recipes.

A Simple Disinfectant.—Put into a saucer some fresh-ground coffee, and in its centre place a small piece of gum camphor, which set on fire with a match. As it burns add coffee enough to burn with it. It gives a very pleasant perfume, much more agreeable than that of pastiles, and it is much cheaper.

Glass and China Cement.—Curdle a half pint of milk with the same quantity of vinegar ; separate the curd from the whey, and mix the latter with the whites of four or five eggs, beating them well together. Add a little quicklime, through a sieve, to make a thick paste. This cement dries quickly and resists the action of fire and water.

Another cement may be made by stirring plaster of Paris into a thick solution of gum arabic, bringing it to the consistency of cream. This is white in color and is very well adapted to mend china. After three days it cannot be broken in the same place.

Still another is made of four ounces of crushed orange-shellac, and three of strong rectified spirits of wine or wood naphtha. The spirits of wine is preferable. Dissolve the shellac in the spirits, in a corked bottle kept in a warm place. The process is aided by shaking, and the composition must be shaken before using. It can be used as a varnish for unpainted wood.

To mend glassware, dissolve boiled isinglass in spirits of wine, half the quantity of spirits being added to the isinglass. This is a transparent cement, which makes it very suitable for mending glassware.

Cracks in Floors.—These may be filled neatly and permanently by thoroughly soaking newspapers in paste made of half a pound of flour, three quarts of water and half a pound of alum. The mixture will be about as thick as putty. It can be forced into the cracks with a case-knife, and smoothed on top. It will harden like papier-maché.

Cracks in Plaster.—A good filling is plaster of Paris mixed with vinegar, which will not set for twenty or thirty minutes, while water will set very quickly, often before you can use it. The putty-like mass must be pushed into the cracks, and can be smoothed off evenly with a table-knife.

To Prevent Mold.—Add to paste, ink, mucilage, or other substance liable to mold, a little carbolic acid. An ounce of this acid to a gallon of whitewash will keep cellars and dairies from the disagreeable odor which is apt to taint milk or meat in such places.

To preserve glasses of jelly from mold, lay on the top of the jelly a piece of paraffine, and let it melt and spread over it. Or the paraffine can be melted and poured over the jelly when cold. This renders unnecessary brandy-paper or other covering.

Spots on Furniture and Fabrics.—These may be removed by a wash of four ounces of ammonia, one ounce each of glycerine, castile soap, and spirits of wine. The soap must be dissolved in two quarts of warm water, and the other ingredients added. Apply with a soft sponge. This wash is very good for silks.

Another furniture wash may be made by mixing a half pint of 95 per cent. alcohol, a quarter ounce each of powdered resin and gum shellac, and a half pint of linseed oil. Shake these well together and apply with a brush or sponge to stains, spots, or mildew.

To Freshen Gilt Frames.—Dust carefully, then wash with one ounce of soda beaten up with the whites of three eggs. Where scratched, patch up with gold paint. To clean oil paintings use castile soap and water, very carefully applied.

Gilt may also be brightened by adding to a pint or two of water sufficient flour of sulphur to give it a golden tinge. In this boil four or five onions, or a quantity of garlic. Strain off the liquid, and wash the gilding with a soft brush. When dry it will look like new work.

To Take Out Paint.—Mix ammonia and turpentine in equal parts, saturate the spot two or three times, and wash out with soapsuds. This will take out paint from clothing even if dry and hard. Paint spots on window glass can be removed with ten cents' worth of oxalic acid dissolved in a pint of hot water. While applying it to the spots, take care that the acid does not touch the hands. Brasses may be quickly cleaned with this wash; but it must not be kept after using, as it is a deadly poison.

BRIEF RECIPES FOR HOUSEKEEPERS

A little quicklime placed in the infested places will drive away any kind of ants.

Burning sulphur in a tightly-closed room will kill almost all kinds of insect life and their eggs and larvæ.

How to Make Leather Waterproof.—Saturate it with castor oil; to stop shoes squeaking, drive a peg into the middle of the sole.

How to Wash Colored Calicoes.—Dissolve 5 cents' worth of sugar of lead in 3 to 4 quarts of pure water (rain-water is best), and, after the garments are washed and rinsed, let them be dipped in and wrung out; it sets the color and keeps it.

How to Remove Tar from Cloth.—Rub it well with turpentine, and every trace of tar will be removed.

How to Set the Color in Lawn.—Dissolve a half-pound of saltpetre in a pailful of water, and dip the lawn in it several times before washing.

How to Remove Egg Stains from Spoons.—Rub with common salt.

How to Remove the Stains of Fruit from the Hands.—Wash your hands in clear water, dry slightly, and while yet moist, strike a sulphur match and hold your hands around the flame. The stains will immediately disappear.

How to Clean Furniture.—Rub with cotton waste, dipped in boiled linseed oil; then rub clean and dry with a soft flannel cloth.

How to Test whether an Article is Gilt or Made of a Gold-colored Alloy.—A solution of bichloride of copper makes a brown spot on alloy, but produces no effect on a surface of gold.

How to Restore Gilt Frames.—Rub with a sponge moistened in turpentine.

How to Clean Gloves.—Pour a little benzine into a basin and wash the gloves in it, rubbing and squeezing them until clean. If much soiled, they must be washed through clean benzine, and rinsed in a fresh supply. Hang up in the air to dry.

How to Clean Hair Brushes.—Dissolve a little soda in warm water, and pour in a small amount of ammonia. Hold the brushes with the bristles downward, and avoid wetting the back as far as possible; shake until the grease is removed. Then rinse in cold water, and put in the air to dry.

How to Clean Hair.—Wash well with a mixture of soft water, 1 pint; sal-soda, 1 ounce; cream tartar, ¼ ounce.

How to Remove Stains from Linen.—Wet the part stained, and lay on it some salt of wormwood; then rub without diluting it with more water.

How to Remove Mildew from Cloth.—Put a teaspoonful of chloride of lime into a quart of water, strain it twice, then dip the mildewed places in this weak solution; lay in the sun. If the mildew has not disappeared when dry, repeat.

How to Cure Mosquito Bites.—Put 10 drops of refined carbolic acid into an ounce of rose water; shake well, and apply as needed. If you hold your breath when a mosquito has its bill in you it cannot withdraw it until you breathe again.

How to Remove Paint from Dress Goods.—When the color of a fabric has been destroyed by an acid, ammonia is applied to neutralize the same; after which an application of chloroform will, in almost all cases, restore the original color.

How to Color Dress Goods Red.—1 ounce of cochineal, 1 ounce of muriate of tin, and a little cream of tartar for each pound of goods, dissolved in enough water to cover them. Boil the goods in this dye 10 minutes. Hang up to dry.

How to Remove a Rusty Screw.—Apply a red hot iron to the head for a short time, the screw-driver being applied immediately while the screw is hot.

How to Prevent Starch from Souring when Boiled.—Add a little sulphate of copper.

HOME DECORATIONS

A Window Garden. Showing a happy arrangement for keeping plants in a south window. In the centre is a wire stand below which are window shelves. The plants arranged to get the sunlight to the varieties needing it most.

HOME DECORATIONS

The Ingle Nook and Mantel. A suggestion for beautifying a room where there is a fire place and mantel and space at each side for artistic seats and cushions. The whole effect is that of warmth and comfort. A few choice ornaments are on the mantel, handy volumes on the shelves and pictures on the wall.

ATTRACTIVE HOME DECORATIONS

SOME COMMON THINGS MADE BEAUTIFUL—CHEAP AND EASY METHODS FOR HOME USE

The growing love for artistically attractive rooms, in cases where the purse does not permit free application to the upholsterer or the domestic art establishment, leads to many ingenious devices to bring beauty out of homeliness, and to produce both from cast-off and useless lumber, and material of more value, articles of ornament for parlor or chamber; while the skill in knitting, crocheting, and other arts of the fingers possessed by many ladies aids immensely in converting homely rooms into charming and attractive ones. It is proposed here to give some examples of decorations both of the homely and the more expensive order, which may serve as useful suggestions for many other articles made from materials in the possession of our readers, or in accordance with their tastes and the means at their command.

A Rustic Rug—Even such homely stuff as the coarse material of a coffee bag, or coarse sacking of any description, may be made into an attractive rug in the manner here described:

Cut the stuff to the shape required. Then, having prepared strips of woolen material half an inch wide, darn them with a coarse needle in and out through the sacking, leaving between each strip loops an inch in height. The colors of the wool may be diversified according to taste. For instance, there may be a black border, with a centre of a single shade, or of a variety of bright colors

After the work is ended, the whole surface may be clipped evenly. A very tasty rug can be made in this simple and easy manner.

A Simple Wardrobe.—A wardrobe of attractive appearance can be made by any one of ordinary ingenuity. To do so take two boards a foot wide and five feet high. Place these the distance apart desired for the width of the wardrobe, and connect them with similar boards top and bottom, making an improvised open framework. Casters should be placed in the four bottom corners, and brass rings screwed into each end of the top board.

Next prepare a pair of curtains sufficiently wide and long, hem the top, slip a brass wire through the hem, and pass the ends of the wires through the rings, letting the curtains fall to the floor. The sideboards of the wardrobe can be stained or treated in any way desired. Finally, wardrobe hooks can be procured and screwed into the upper board.

Bookcase.—A bookcase suitable for ordinary purposes may be improvised from an old bureau which has lost its mirror, by placing above it a set of shelves, made by two upright boards screwed to the sides of the bureau, and two or three cross ones. Paint and brass handles will serve to make the old bureau look new. By screwing brass rings into the ends of the top shelf and slipping a rod through them, curtains may be hung of any stuff preferred.

Mantelpiece.—Many houses still contain the high, old-fashioned, wooden mantelpieces, painted to imitate yellow-grained black marble, and a sore affliction to the eyes. A little paint may convert an eye sore into an ornament. Ebonize the entire surface, and paint a spray of flowers in each panel, taking care to select blossoms whose tints harmonize with the decorations of the room. In a chamber furnished with white and blue, a mantelpiece of this kind would be pretty painted white, with the panels outlined in blue. If desired, some geometrical design or figure in outline can be painted in each panel. Above the mantelpiece fasten two shelves, the upper one shorter than the lower, supporting them on brackets. In this manner a very unsightly mantel may be converted into a very pretty and attractive one.

Screen.—If your house is small and your family large, a folding-screen in each bedroom is an important addition. Very pretty and inexpensive ones may be made by covering a wooden frame with coarse canvas, and on this arranging pictures cut from illustrated papers. When the canvas is entirely covered, varnish the whole, and be happy in the knowledge that you have added a useful adjunct to your bedroom furniture, as well, perhaps, as provided hours of amusement for sick children in hunting out the various pictures.

Window Draperies.—A novel and pretty window curtain has been made easily and cheaply by the practice of a little taste and ingenuity. Its material was the yellow silk ribbon which is used to tie bundles of cigars. This was made into squares, which were joined together by bands of antique lace insertion until the full length was reached. The top and bottom were then hemmed, and the lower end ornamented with a border of white lace and a row of fringe.

Mirrors.—If through ill-fortune a looking-glass is broken, it is easy to utilize its larger fragments. These may be cut into square or diamond shape, and inserted in plush frames, or painted or gilded wooden frames. Thus utilized, a misfortune may be converted into an advantage in decoration.

Sofa Pillows.

Where there are easy-chairs, and sofas, or lounges, a beautiful sofa pillow adds much to the effect in the decoration of a room. There should be a plentiful supply of these useful articles, as they afford opportunities for ladies to exercise their ingenuity in working out beautiful designs. These vary, from the plain pillow made of denim, with cord at the edges, both for finish and for durability, to the more expensive plush and silk pillows worked with the needle. Ordinary butchers' linen may be taken, a square design of drawn work made in the centre, and a ruffle may be made around the edges of red and white taffeta ribbon in alternate rows. The back of the pillow may also be of linen.

A sofa pillow may also be made of crimson denim, with dark blue fleur-de-lis embroidered upon it in dark blue silk, which may be finished with a crimson cord. The back should be made of dark blue denim. This cover describes one which would answer for a Pennsylvania University. Other colors may be used to represent any other college. Inexpensive sofa pillows may also be made of huck toweling embroidered in wash silks in white, pink, light green, light and dark yellow, and black. A ruffle may be added of bright red silk, and the back of the pillow made of toweling. A very inexpensive sofa pillow may be made of squares of silk, ribbon and velvet, each square slightly padded to give a raised effect. The edges of the pillow may be finished with narrow ruffles or silk cord. This variety of pillows offers great opportunity for ingenuity in using remnants of silk and velvet, and they are deservedly popular.

Quite an attractive pillow may be made of white linen, on which autographs of friends or of a class may be written in lead pencil, and outlined in several shades of green embroidery silk, or any other color which suits the fancy of the designer. The pillow may be square or octagonal in shape. A dainty pillow of this kind may be filled with dried rose leaves.

Ornamentation of Bedrooms.

Where there are several bedrooms, it is not unusual to furnish each one in a color

of its own. One room, for instance, may be furnished in blue and white. The walls may be hung with satin striped paper, the draperies made of inexpensive materials, worked with ruffles and such designs as the occupant may desire, or which may please the designer. Another room may be furnished in red and another in green, and so on. The proper arrangement of the draperies of the windows adds much to the effectiveness of the decorations. The bedroom should not be overcrowded with furniture, and each article should have a place where it can always be found.

Living-Room.

Upon the decoration and furnishing of the living-room depend much of the warmth, comfort, and pleasure to be obtained from it. The old-fashioned fire-place is again coming into vogue, as the warmth and light of a good wood or coal fire add greatly to the cheer of the home. The mantelpiece and surroundings should not be receptacles for odds and ends that may be placed there by various occupants of the room, but should be tastefully decorated with a mantel clock, vases of flowers or dried grasses, and one or two ornamental articles. Overcrowding should be avoided. On each side of the mantel should be hung suitable and suggestive pictures, neatly framed, always avoiding the cheap penny pictures, which do nothing more than encumber the walls. A few choice pictures are much more to be desired than many cheap prints. Books should be arranged on shelves, or in bookcases specially prepared for them. Care should be taken that they be properly arranged in such order as may be agreed upon, whether by titles or by sizes. Window draperies for the living-room should always be bright in color and serviceable. There are several ways of hanging them; probably the most serviceable one is by rings from poles placed across the window.

The Convenient Kitchen.

The kitchen is the workshop of the home. It therefore should be furnished and arranged for the special convenience of the housewife and cook, and for the health of the occupants of the home. Plenty of light and air should be provided. At some time during the day it should have sunshine in abundance. In building a house it is more important to decide the location of the kitchen than that of the parlor. The sanitary arrangements include proper drainage, copious and clean supply of water, the best sanitary plumbing, generous room in the closets and pantries, and facilities for the proper care of cooking utensils. Kitchens should be made attractive as well as useful. This may be accomplished by giving attention to the hanging of simple curtains at the windows and over open cupboards; by the arrangement of dishes and utensils in the places where they belong; by tidiness in the furniture of the kitchen, and by general cleanliness. It is not customary to decorate the walls with pictures. The mantelpiece should have its clock and one or two suggestive ornaments.

Window Gardens.

Nothing adds so much cheer to the house as beautiful window gardens filled with flowers and potted plants. These decorations are within the reach of all, and there are many beautiful designs which will suggest themselves besides those we offer. One of the prettiest we have seen is a window garden occupying the south end of a dining-room, arranged with a wire stand in the centre. These stands are readily procured at almost any merchandise store, or they may be readily made out of light pieces of lumber in the form of steps, which, if neatly painted green or red, will be very serviceable. Window shelves may be made and covered with heavy paper or oil cloth of a neat figure. The plants may be so arranged as to give sunlight to the varieties needing it most.

Another very useful form is to make for the window garden a box, in length equal to the width of the window, six or eight inches wide and eight inches deep. The box should be lined with zinc and filled with sand or light mold. Not more than six or eight plants should be used in an ordinary window-garden box. In winter time the plants should be carefully protected at night from the frost caused by the falling of the temperature of the room. This may be

easily done by putting heavy paper between the plants and the window.

Decorations for Public and Festive Occasions.

It is desirable to decorate rooms for both public and private occasions, such as anniversary days and festal days. Decorations intended to instil patriotism are frequently used on Children's Day, Washington's Birthday and the Fourth of July. The national flag is always a prominent feature. The platform, or stage, or the part of the room to be used for the entertainment, is made the centre of the decorations. Flowers, palms and vines are always beautiful, and their arrangement depends upon the taste of the parties directing the same. It must not be overlooked that even the most common flowers and plants form the prettiest decorations. Although the farmer may fight the daisy as a nuisance in the field, yet the decorator will find that it makes one of the most beautiful decorations, either bunched together or in chains, woven around walls and furniture.

Wedding Occasions.

No wedding would be complete unless there were decorations in the parlor or church where the marriage ceremony takes place, and also of the dining-room and table where the breakfast or dinner is served. There are many happy suggestions for such occasions. It is customary to decorate the church by running arches, made of flowers and vines, over the aisle along which the bridal procession takes place. Festoons may be hung from the ceiling in artistic lines. Care should be taken that harmony in arrangement prevails, and one part is not decorated at the expense of another. Potted plants are always beautiful in decorating the platform and pulpit and for tables and window ledges. White ribbon, either in bows, or nicely looped, adds also to the effectiveness of the decorations.

Decorating the Table.

For bridal or festive occasions very simple and pretty decorations may be made by the arrangement of a few flowers on the table and good taste in arranging the china, the silver, and the linen. It should not be overlooked that too much decoration is worse than no decoration at all, and the effectiveness is often lost by carelessness in arranging one or two small items. Symmetry and harmony should not be lost sight of. The color effect should be left to persons who have "an eye for color."

Fancy Work for Leisure Hours.

In these days of household leisure taste in common art has developed, and we care much more than did our grandparents about surrounding ourselves with things of beauty. The struggle of life was harder for them, and they had little time to adorn tables and chairs, arrange artistic effects in rooms, and make windows and walls rich with color and fair with soft drapery.

Embroidery.

Among the most popular home occupations for present-day ladies may be named embroidery. The loom and the spinning-wheel, in one form or another, are as old as civilization, and our devotion to the embroidery frame is but a return to the occupation in which mediæval ladies found delight. Few of them could read or write, and the needle was their only form of expression. This is no longer the case; we are not so narrowed in our range, and yet embroidery continues to be pleasant work for a group of merry girls or thoughtful women.

The most expensive materials for this work are silk, velvet, tissue, gold and silver cloth, velveteen, and plush. Among cheaper materials are linens of various degrees of fineness, crash, sateen, sheeting, serge, and Canton flannel.

Every lady who gives her mind to it, even if her skill is not great, can improve an unattractive room by a few judicious alterations, and every young girl may learn to embroider at odd moments, and by the work of her hands transform her abode from ugliness to beauty.

Crewels are used for working on linen, serge and flannel. Tapestry wool, a thicker substance, is useful on coarse fabrics. Embroidery silk is preferred for silk, satin, or fine materials. In working with crewels

the threads should be cut into short lengths, it being difficult to use a long thread without puckering the work.

Silk plush, the most elegant and effective material for banners, draperies, and covers, is very costly. Woolen plush is a little less costly, but is also expensive. Canton flannel, in all the rich and desirable colors, is a much cheaper material. As regards the cost of these and the other materials named, our lady readers are probably well informed.

Stitches.—Stem-stitch is not difficult. It is simply a long stitch forward, a short one backward, and then another long stitch a little in advance of the first. In working outlines, care must be taken to exactly follow the line of the pattern, and to keep the thread to the left of the needle. Some knowledge of drawing is necessary for good embroidery. Leaves and flowers or conventional designs should be nicely drawn or stamped before beginning to work. A lady is sometimes so deft with her needle that she can compose her pattern as she goes on, but this is not apt to be widely the case. The stem-stitch may be longer or shorter according to fancy, but it must be even.

Split-stitch is a variety of stem-stitch, but in bringing the needle up through the material it must be passed through the embroidery silk or crewel.

Satin-stitch is the same on both sides. The needle must be taken back each time to the point from which it started. Rope-stitch is a twisted chain-stitch; blanket-stitch is the ordinary buttonhole stitch less closely worked, and feather-stitch is a broken stitch, worked in a light airy way, to suit the convenience of the seamstress.

Drawn-work consists in drawing out threads from linen, and working designs in the drawn space or filling in with needlework. This is pretty for tidies and for the bordering of pillow-shams, spreads, and curtains.

The embroiderer needs a smooth thimble, as a sharp one is likely to catch in her silk, a sharp and pointed pair of scissors, and a set of needles of different sizes.

Appliqué work is simply transferred work. Cut out pretty figures from damask or cretonne, or the best parts of old and worn embroideries, and fasten them securely on a foundation of lace, linen, or silk.

Things to Embroider.—In addition to curtains, lambrequins, screens, and panels, which only a few women have time for, cushions and chair-backs may be made in great variety. Sofa cushions are always desirable as gifts. A long narrow cushion for the back of an invalid's chair, a neck-rest for a rocker, covers of linen to be slipped over a chair that has lost its freshness, little round table mats, pieces to brighten the centre of a dinner-table, portfolios and letter-cases, slippers and sewing and knitting-aprons, with pockets to hold a bit of work, thimble, and needle sheath, are among the many articles that may be made in leisure hours.

Crocheting.

The little crochet hook is a very old instrument. Its charm is that with so small a tool so many beautiful things may be produced. From a counterpane to a collar, almost anything may be made with the crochet needle. Babies' afghans and sofa quilts for convalescents are often crocheted. There are few occupations more fascinating than this to those with time to spare.

Knitting.

The delight of knitting is its sociability. Embroidery demands close attention, but the knitter may talk at the same time, her fingers moving with automatic precision. What pictures rise in our mind's eye of dear old ladies knitting by the fire, their needles flashing and their voices busy with social chat! Shawls for breakfast or evening wear can be either knitted or crocheted, and many other articles at once useful and ornamental, are at the command of busy and skillful fingers in this old-fashioned art.

Decalcomanie.

Beautiful jars, vases, umbrella holders and boxes may be made in this favorite work, for which scrap pictures are necessary. It requires taste to arrange these tastefully, and when well gummed, they should be varnished to preserve them and

to impart a finish. Choose boxes, vases, or bowls of clear, flawless glass. Cut and gum your picture very carefully on the vase, which must then be varnished. Pass a coating of gum over the inside of the vase, then, if the outside is quite dry, paint it in oil, in any color you please. Tall vases to fill with cat-tails and grasses, or to contain a potpourri inside, shedding, whenever stirred, its faint, spicy odor over the drawing-room, are very interesting decorations, and have about them an unmistakable air of antiquity: that is, if the vase be of ancient pattern, or the ornaments those of Assyrian, Egyptian, or Etruscan character.

Potpourri.

The potpourri just referred to may be made of various combinations of fragrant materials. A very agreeable one may be made by the following recipe for a rose-jar: One-half peck of rose leaves, one-half pound each of common salt, bay salt, and brown sugar; one ounce each of storax, benzoin, ground orris root, cinnamon, mace, and cloves. These should be pounded and mixed by a druggist.

To the above may be added orange and lemon verbena and other aromatic leaves. Putting these ingredients in your jar, and stirring them frequently with a wooden spoon, you can, at any time, by airing and then closing your room, fill it with a delicate perfume.

Wax Flowers.

Wax flowers are ordinarily only clumsy imitations of the lovely blossoms which adorn our gardens, or smile upon us from lurking-places in wood or wayside, yet the artist in this work is sometimes so successful as to cheat the bees and birds.

In endeavoring to learn this art do not be too easily discouraged. Practice in this, as in all things, makes perfect. You may try to make one flower and produce a result more nearly resembling another, but if you would succeed you must not let such failures stop your work.

You always have the advantage that your model is perfect. You are not required to make any improvements upon nature; you have only to imitate, and the pattern is before you in all its charming perfection of shape and tint.

Practice will fit you in time for closely reproducing nature, if the exact imitation of her work is what you are to aim at. New models are always at hand; spring and summer bring them, and the coldest winter day need not be without them blooming in window-pot or hothouse avenues.

To say there is a peculiar fascination in this art is only to express what has been realized by nearly all who have tried it. And when you have succeeded and your productions bear a close resemblance to their original copies, your home has beautiful ornaments.

Wax should be kept in a box, closely covered from dust, and in a cool place. A brush must be provided for every color, and strictly kept for that one tint. Your sable pencils may be cleaned after using for one color, and employed in another.

Always use a pair of scissors to cut out your petals, and take as your pattern the flower you wish to copy.

In purchasing, it is economy to obtain the very best wax. You will need white, cream-tinted, very pale green, smilax, tea-rose leaf, pale spring- and deep spring-green tints for wax, but at first a few colors will suffice. In paints, both in powder and cake, the waxworker should have carmine, chrome-yellow, burnt sienna, burnt umber, Prussian blue, indigo, crimson lake, violet, carmine, rose-madder, French ultramarine, flake-white, and Indian yellow; a sufficient number of tinting and sable pencils; some modeling pins, wires covered with silk for fine, and with cotton for coarse stems; a palette and palette knife; some best Bermuda arrowroot; green and white down for leaves; two sizes of wooden molds for the lily of the valley and a cutter for heliotrope, and a bar of India ink. This is a much larger outfit than the novice requires, and will only need to be obtained gradually, as the worker improves and grows more ambitious.

To take the pattern of a petal, place it on white paper, and brush it over with a tinting-brush. The form of the petal will

be left white on the paper, and may be cut out. Or the petal may be laid on a piece of paper and its pattern cut out in that way. Always cut the petals with the grain of the wax. The fingers are excellent modeling tools. A few drops of glycerine used on the hands an hour or two before working makes them soft and pliant. Do not work with brittle wax. To remove its brittleness set it awhile in a warm room, if it has been in the cold.

Flower and Fruit Molds.—To take a mold for flower or fruit, mix some very fine plaster of Paris in a bowl with water, to the thickness of cream. Pour it lightly over leaf, or fruit, or bud, which it is well to place for the purpose on a glass slab. In about ten minutes the plaster will be hardened sufficiently to lift it from the slab. Pare away with a penknife any plaster that may have run over. Let the mold stay in the sun, having removed the leaf or bud, until it has hardened. In twenty-four hours it will be ready for a coat of varnish, which must be very thin indeed.

"To take the mold of such a flower as a fuchsia or an unopened bud, oil it, pour your thick plaster into a paper form, and allow the bud to sink on its side in the plaster. Let it sink only to the centre line, leaving one-half exposed." This we are told by a teacher of experience. "Lift the mold out of the plaster before it is set too hard, scrape the rim smooth, and with the point of a penknife make two little cavities, one at the stem end, the other at the point where the four sepals of the calix fold, and carefully brush away any little particles of plaster; place this half of the mold back in the paper form, and paint the rim, the hollow, and the little cavities with sweet oil; place the bud again in the cast, and pour enough plaster over the exposed part to fill the paper form."

In order to take a wax mold from this, dip it into cold water, and pour melted wax into one-half; fit the other half to it, turn it upside down, slowly, and hold in your hand till it has hardened. On removing the mold you will have the perfect bud. If you were able before the plaster became too firm, to bore a little hole in the mold at the stem end, you can slip the wire stem through before the wax hardens.

Proceed in the same manner to make molds for fruit, using your judgment according to shape and size.

Wax flowers and fruits are very salable at fairs and bazaars, and the lady who knows how to make them well is always sure of presenting her favorite table with something which will make a fine display, and bring in a good profit when disposed of.

Phantom Leaves.

Phantom or skeleton leaves are the ghostly remnants of the leaves that have waved on the trees in summer. They are troublesome to prepare, but are very pretty when finished. Gather the leaves when they are perfect, and then lay them in a large jar, filled with water. Leave them there until they decay, when the fleshy part of the leaves can be easily detached from the framework. The translucent, thread-like form of this delicate veined work is very beautiful. Having loosened the green part, bleach the remainder by infusion in a strong solution of soda. When quite white, bouquets or wreaths may be made of different leaves in combination, which may be arranged on a dark background, or set under glass.

Autumn Leaves and Ferns.

Happy hours may be passed in gathering and pressing ferns and autumn leaves, with which to adorn the house when winter has made desolate the fields without.

Never have too many of these in one apartment, for ornament should always be subordinate, and no room should be smothered with either growing plants, or pressed leaves and ferns.

In preparing these, the brilliant maple and other leaves should be, after drying and pressing, dipped into thin wax, or varnished. When once safely prepared they may be hung about the rooms in such manner as may seem most ornamental. They can be, if desired, sewn on paper in suitable patterns, and framed under glass as winter pictures of the flown summer.

To prepare the leaves, press them immediately after gathering between old news-

papers, or, if you have it handy, large sheets of blotting-paper, on which lay a thin, smooth piece of board. Take care to change the newspaper every day until thoroughly dry. Then wax or varnish as above directed.

China Painting.

For this work procure your colors in tubes, since you will thus acquire a greater variety than you would for either oil or water-color painting. The colors most in use are black, white, gray, and several shades of red, brown, green, yellow, and purple. These may be obtained at any art-store. The tube colors are diluted with turpentine. You will require a porcelain palette, a glass slab, several camel's hair brushes of different sizes, a bottle of spirits of turpentine, one of 98 per cent. alcohol, and small bottles of oil of turpentine, oil of lavender, and balsam of copaiba. A steel palette knife, and one of horn or ivory; a rest for the hand while painting, made of a strip of wood about an inch long and twelve inches wide; a small glass muller; and a fine needle set in a handle for removing tiny particles of dust.

A plate, a flat plaque, or a tile is best to begin with, and the first design should be of the simplest. One must learn by degrees how to use the colors which will best stand the firing, which is the crucial test. There are places in the cities to which articles of painted china may be sent to be fired, few people having the facilities to do this in their homes.

Painting can be applied to china, to velvet, to satin, to cloth, and to almost every fabric and material in use among civilized peoples.

By study, careful watching of processes, attention to details, and obedience to the directions of the best manuals, one may learn to paint creditably without a master. But all arts are rendered less difficult by a painstaking teacher, and many weary hours and disappointments may be saved by joining an art class.

Amateur Photography.

To have one's picture taken was formerly a family event; now it is the work of a fraction of a minute in the photographer's chair, while the art of photography is a common amusement for leisure hours.

An amateur photographer's outfit is not very expensive, and is an exceedingly attractive and instructive possession to young and old alike. The negatives taken will be developed by any professional photographer, or may be by the amateur himself, if ingenious enough to prepare the necessary appointments and study the art. For this he must resort to works on photography.

Screens.

Our forefathers did not think their houses complete without screens. These are useful for breaking off the heat where there is an open grate, and for placing near a door often opened, to prevent a draft, and are still quite popular. Very handsome ones may be made of feathers by gumming them on a framework of gauze or other material, stretched by wire. Or card-board may be used for the background. The lad who is skillful with tools may make screens of thin wood and other light materials, a framework of strips being made and fastened together, and then covered with the material preferred. If it is to be a folding screen. the separate parts can be readily joined together with hinges.

Care of Domestic Animals and Plants.

It seems advisable to supplement what we have said about the methods of making home attractive with some consideration of other important elements of home interest, the plants and flowers which change our windows into miniature conservatories, and the singing birds and other pet animals to which we give loving care, and whose lively arts and sweet voices help to make the hours pass pleasantly. First among these it will be well to speak of the prime favorite among all the feathered tribe, the golden-plumaged and sweet voiced canary.

The Canary Bird.

No birds, except pigeons and fowls, have developed under man's care into so many varieties as the canary. The original wild bird is a finch, of greenish hue. Among

HOME LIFE IN OLDEN TIMES

A glance will show the contrast of life in colonial times and at the beginning of the 20th century

domestic birds there are several varieties fully or partly green, but yellow is the most admired tint, there being several shades of this favorite color. The canary, above all other birds, lives and thrives in a cage. It has been bred for so long a series of generations to cage-life that its native wildness has vanished, and in the open air it is quite incapable of taking care of itself. In the cage it is bred with greater ease and success than almost any other bird, and the raising of canaries is in some localities, as in the Hartz Mountains of Germany, a distinct and profitable business.

It is as a song-bird that the canary is most valued, and for many generations its powers of song have been developed in Germany until they approach perfection. The young birds are carefully trained, some by skillful older singers, some by the flageolet, until they can execute certain fine trills or passages of melody. Some songsters have the wonderful compass of four octaves, and can sing various "shakes" in marvelous style. Each burst of song should, for the best effect, end in a soft, flute-like, falling passage, an effect which it takes six months' training to produce. Many birds of excitable temperament are apt to break into loud, detached notes, which spoils their song to the ear of an adept in canary music.

The song of the canary is evidently a matter of choice and training, and the German song canary has a voice vastly more beautiful than that of the wild bird. Cock birds of fine voice are chosen to breed from and also as tutors, young birds, if possible, being trained in a room where they can hear only the tutor, for they will pick up bad notes as easily as good ones if left where they can hear them. The tutors and pupils are allowed to sing only about three hours each day, being covered up the rest of the time. Birds that have caught up bad notes need to be drafted off, before they can make mischief among the others. If there is no good tutor, a flageolet will serve, with the condition that the same air must always be played in exactly the same way.

The colors of cage birds vary considerably, through green, yellow, white, brown, gray, etc. The yellow and the white have often red eyes, and are the most tender; those most resembling the wild race—dusky green above and yellowish green beneath—are the strongest. The bird now most admired is of yellow or white body, with head, wings, and tail of a lively yellow. The golden yellow bird, with head, wings, and tail black, or dusky gray, comes next in estimation. There are other admired shades of color, those spotted or speckled being of least value.

Care of Canaries.

In keeping canaries much attention must be paid to the cage, which is very liable to be infested with the canary mite, a plague so constant that great care is needed to avoid it. It begins with a floury dust, which is soon found to be alive, the insects becoming larger and reddish in color. They harbor in the minutest crack. To destroy them, every cage should be completely plastered with whitewash and carbolic acid at the beginning and end of each breeding season, each chink being carefully filled. If any of the "flour" appears on the perch, this should be withdrawn, the place painted with oil, and a new perch with an oiled roof put in. If it is in a crack, paint it over with spirit varnish. If the case is a bad one, paint with solution of bichloride of mercury, rubbing it well into the places, and, when dried, varnish over it. In this way the enemy may be overcome.

The food of the bird is an important matter. In Germany summer rape seed, of mild quality, is chiefly used, the cocks—the only singers—having also a little breadcrumb and egg. To force them, dealers often feed them almost entirely on egg-food, and the bird, when purchased, is fed solely on canary seed, or canary and hemp seed. This sudden change is apt to prove injurious.

Canaries are liable to various disorders which need special treatment. Colds may be cured by putting twenty drops of paregoric, a bit of gum arabic the size of a pea, and half a teaspoonful of glycerine in the water. Loss of voice may be treated in the same way, but in either case it is best to give first a drop or two of castor oil from the point of a penholder.

A dirty cage or stale green food may yield its result in diarrhœa. This is best treated by oil given as above, afterwards adding gum to the fountain and sprinkling a little prepared chalk in the egg-food. If green food is properly given constipation is rare. When it occurs, a teaspoonful of glycerine, followed by one of infusion of gentian, should be added to the water.

The feet need to be examined now and then, since balls may gather upon them and cause much pain. The claws also may need to be shortened a little from time to time, being clipped with scissors.

The Mocking Bird.

Among American birds, the mocking bird stands high in public estimation. The vocal powers of this plain-plumaged favorite are extraordinary, no other species approaching it as a mimic, except its near relative, the cat bird. Its powers of imitation are wonderfully varied and perfect, and it is inclined to show them as well in captivity as in freedom. Its own song is full, bold, and exceedingly varied, and it has the faculty in its native bush of repeating the songs of all its feathered neighbors as exactly as an echo. In captivity it can be taught a long air by its master, and will imitate the quavering trill of the canary and the fluting whistle of the redbird with such fine execution as to silence these expert singers. It can imitate many less musical sounds, will whistle for the dog, squeal like a hurt chicken, bark, mew, creak like the wheelbarrow, and vary its notes endlessly. A well-trained mocker is a wonder, though at times it may become an annoyance from its endless vivacity.

The natural food of the mocking bird consists of insects, fruit and berries, and a few insects or meal worms should be added to its daily diet, which may consist of what is called fig-dust—finely-grained oats mixed into a stiff dough with milk and water. Carrot and boiled potato may be given alternately, with a little egg-food. Gravel and water, of course, are needed by all birds.

Other Song Birds.

The Virginia redbird is at once beautiful in plumage and a favorite for its loud and almost constant song. It is hardy, and if properly fed is liable to few ailments. It needs to be fed with seeds, soft food, and insects. A little cuttle-fish bone should hang in the cage, and a red pepper-pod.

Others of our native birds kept as cage birds are the beautiful oriole, the merry bobolink, with its canary-like song, the handsome goldfinch, with its sweet warble, the brown thrush, and others of more or less powers of song.

Of foreign birds may be named the European starling, a handsome fellow, of beautiful black plumage speckled with a yellowish white, and with a song of great sweetness. It sings summer and winter, and can be taught to sing and whistle tunes. It needs soft food, doing well on bread and milk, with a little animal food and sweet and ripe fruit. It is fond of bathing, plenty of water being essential to its health. It must have a deep saucer of gravel or a large turf to dig its beak in, which otherwise will grow deformed.

There are several other European birds of good voice, chief among them, of course, the nightingale, which, however, does not thrive in a cage. The green linnet is a pretty fellow, and, mated with the canary, produces the finest of singing birds. Other handsome foreign birds are the Java sparrow, a quarrelsome little fellow; the Japanese robin, a good songster and ready imitator, and the beautiful South American troopial, a lovely pet with excellent powers of song.

Parrots.

Among cage birds not noted for sweetness of song, yet of high popularity, may be named the gray parrot, a familiar inmate of hundreds of households, and widely welcome for the part it takes in the conversation of the family. It is, in its way, as imitative as the mocking bird, but its vocal powers are adapted to the imitation of words instead of song notes, and its achievements in this direction are often extraordinary, especially as the uncanny bird frequently makes his words fit the occasion so closely that he seems to know well what they mean.

The domesticated parrot has no objection to the cage, often manifesting uneasiness when let out for a promenade. The

food of the gray parrot should consist of maize, oats, wheat, and bird-seeds, with occasional nuts and biscuits, and ripe fruit in its season, this being very useful and wholesome. They can be easily taught to eat potato, and bread and milk and other soft food may be freely given. They will eat meat readily, but, as it tends to produce disease, it should not be given. They should have frequent opportunities to bathe, and, if they fail to do so, should be showered in summer, now and then, with warm water from a syringe.

The Amazon parrot, a more highly-colored bird, is as good a talker as the gray. Its plumage is green over most of the body. Its food and general treatment should be as above described. Of other large parrots we may name the king parrot, a splendid red and green bird, Pennant's parrakeet, and the rosellas. These must all have the same diet of seeds and vegetable food, with fruit in the season. The beautiful king parrot, one of the quietest of these birds, breeds freely in captivity.

Parrots usually leave off screaming when they grow tame and familiar, but there are some hopeless cases, and several cockatoos together may prove worse than a brass band. The beaks of the larger parrots are also so strong that only very stout cages can stand their attacks, and bad-tempered birds need to be dealt with cautiously, as they could break or sever a finger with great ease.

As a general rule, the food of all parrots should consist of grain and seeds, especially millet, maize, or harvest grains in the ear or on the stalk. Sunflower seed is highly relished, and such green food as salad herbs, chickweed, groundsel, etc., should be given freely, with a twig from some green tree to gnaw at. Biscuits are good in moderation, as also nuts and sweet fruits.

There is a large family of small parrakeets, the so-called love-birds, of remarkable beauty of plumage, at the head of which, for beauty, hardiness, and docility, is the shell parrot of Australia. This bird breeds in captivity as readily as the canary, and, as it is very gregarious, it does best in an aviary, where numerous pairs can be let loose. For breeding it must be provided with a log, with a suitable hole made in it, its native nest being built in hollow logs. There are other varieties of parrakeets kept in captivity, but some of them are delicate and hard to keep. They can be fed on millet, maize, canary seed, and the like.

Pigeons.

There are few pets which give so little trouble to keep and rear as pigeons, owing to the fact that they bring up and feed their young until these are old enough to provide for themselves. Cage-birds, it is true, do the same, but there are many dangers and mishaps to birds grown in confinement, which the pigeon, with its outdoor exercise, escapes—except in some of the highly artificial "fancy" varieties.

In keeping pigeons, the first rule to observe is never to *crowd* the birds. If there is only a small space, one good pair of pigeons will rear more young in it than several pairs. A room with six feet square of space will accommodate about six pairs of breeding-birds,—not more. There should be fewer, unless the young are sold or eaten as they grow large. The pigeon-cote in a wall or at the top of a pole is fit for only the most common and hardy pigeons, and these if used remain wild and cannot be tamed or handled.

Pigeons must either be allowed to fly out at liberty or have a wire-enclosed space outside in which they can take exercise. A space twelve feet long and six feet wide and high will do very well. It should have shelves at the ends, affording a flight from one shelf to the other. The floor should be covered with lime and sand or some form of concrete, so that it may be easily cleaned. It needs nothing else except a vessel of water for the pigeons to bathe in. This may be three or four inches deep and two or three feet square, the water being renewed every morning.

Within the loft nesting places must be provided. A simple kind is a series of shelves across the back of the loft, with an upright partition in the middle, dividing it into two sets of shelves. Boards must be nailed down the front, leaving a central opening for the birds to each shelf space. Each length of shelf forms a breeding place for one pair of pigeons.

Perches for the birds must be fixed along the sides of the loft, as roosting places, with slanting boards beneath to catch the droppings of the birds. These can be very easily cleaned. The loft should be painted, and scrubbed at intervals with carbolic soap, or whitewashed at suitable periods with hot lime. To avoid fleas or other vermin, cover the floor with an inch of coarse pine sawdust. If the droppings be raked off every few days, this need not be renewed for several weeks.

For pigeons in confinement, the permanent staple diet should be good gray peas. In winter these may be changed to small sound tick beans. Either should be mixed with one-third of large tares, and a little good barley may be added. Beans are too hard in summer, and the diet should consist of mixed peas and wheat, with small corn. For very small pigeons small peas must be selected, with a few tares. Pigeons are very fond of hempseed, but nothing can be worse for regular food. A handful now and then is stimulating. Small seeds, like canary and millet, are much relished, and are useful for the young birds. The food should be given in some kind of a hopper, so that the birds cannot foul it with their droppings. Pigeons at liberty eat all kinds of things besides grain, such as grubs and small worms. Some will eat minced meat in confinement, and others relish boiled potato, bread and milk, etc.

There is one element of pigeon diet which must never be omitted. They have a craving for lime and salt, and will pick at old mortar. Take equal parts of old mortar pounded, sandy gravel, and loamy earth, and add to a gallon of this a half pint of cummin seed and as much coarse bay salt. Mix this with strong lime into a mortar, and keep it constantly supplied to a box, with a slit near the top into which the birds can get their heads. If their bodies could get in they would soon tread it hard. If old mortar cannot be had, old slaked lime will do, hard enough to need pounding.

Highly-bred pigeons are subject to various complaints, from which the hardier kinds are largely free. For the former a special handbook of diseases and treatment will be necessary. For the latter a simple treatment suffices. Colds will often yield to a pinch of Epsom salts and shutting the bird up in a warm pen, bathing the legs in hot water and drying every night; diarrhœa, to a few drops of chlorodyne. Wing disease is somewhat frequent in confined birds, hard yellowish lumps showing on the joints of the wings. These should be painted daily with spirits of turpentine or tincture of iodine, or rubbed with iodine ointment.

Rabbits.

The rabbit is a boy's favorite, needing, of course, much more space than a bird. It can be best kept in a dry shed, ventilated at top only, and well lighted. The floors are usually of earth, but are better if made of concrete or paving stones, for convenience in keeping clean. Even a rough shed open at the front is much better than none at all, or a large door or shutter fixed over a couple of hutches. The rabbit will not thrive without light, and it is very susceptible to bad weather, being subject to "snuffles" (a kind of influenza) and other disorders.

A breeding hutch should not be less than three feet long and eighteen inches wide, with a partition a foot from one end, to make a sleeping chamber. Near this must be a round hole, for the doe to pass in and out, with a sliding shutter to close it. Rabbits are very prolific, having usually eight or ten young four times a year. These should not be taken from their parents till they are six weeks old.

The rabbit is easily kept, feeding on grass, hay, vegetable food, fruit, scraps of bread, and almost any fresh vegetable matter. The cuttings and clippings of the kitchen are welcome to the hutch. It is easy, however, to give too much food, and wrong to give it wet. Some kind of grain or seed is the basis of sound rabbit food, oats being the best. It is wise to give only a little food at a time, and keep the rabbits rather hungry. Overfeeding is bad.

In addition to the common rabbit, there are many fancy breeds, among them the Lop-eared, the Horn, the Angora, and the Maltese. Some of these are very odd-looking, but none of them are as handsome as the pure white, pink-eyed breed.

The Belgian Hare.

This interesting animal is proving to be a popular one for small investments. They are very prolific breeders, rearing several broods each season. They are larger than the common rabbit and are better eating. A dressed Belgian hare brings good prices in the market. Their meat is light in color and of excellent flavor. They are easily cared for and cheaply fed. A pair of Belgian hares will soon multiply into a large number and bring quick returns in money or meat for the original investment.

Other Animal Pets.

Of other animals kept as pets may be named the Guinea pig and the squirrel, the former kept much like the rabbit, the latter in a cage. The squirrel in captivity is an active fellow, fond of exercise, and if provided with a revolving wheel, for an occasional run, will keep healthy and happy. It should be provided with nuts for food, with corn or wheat, or pieces of dry bread; also a little bread and milk, squeezed rather dry. Some bits of meat are relished, but should be given sparingly.

Rats and mice are also kept in cage-life, the rat being almost as much given to comical antics as the monkey. The outer cage should have several perches and a wire ladder or two. The revolving cage sometimes used is a cruel device for these animals; a roomy cage, with perches, ladders, and swings, is far better and more interesting, from their varied gymnastic powers.

White mice, with their pretty pink eyes, are pets admired by many. They are tame and hardy, and can be trained to perform many amusing tricks. Corn meal is their favorite food. The white rat, a Chinese species, is very similar to the white mouse, and if kept clean is an interesting pet. Of course, these little creatures are not likely to be welcome to those who bear an inborn prejudice against them, but they are innocent and harmless animals, and those who keep them grow very fond of them.

The Aquarium.

The indoor aquarium is a very attractive feature in many homes, and is capable of being varied almost endlessly. It will furnish many hours of study and occupation. Its simplest form is the familiar globe for gold and silver fish, which can be set on a stand and forms a very attractive ornament. It should be kept about three-fourths full of water, which needs to be changed at least once a week. It is well to put a little washed gravel at the bottom, and some clean duckweed or other water-plant should be put in the water. These aid to keep up the supply of oxygen, and the fish will nibble them occasionally. Small particles of bread or biscuit serve for food.

A larger aquarium is of much more interest. This is usually an oblong tank, with glass sides and ends, made water-tight. A glass plate can be laid over the top, with a narrow open space, so as to admit air and keep out dust. The tank should be bedded with clean, sandy gravel, which needs to be well washed, on which is placed some kind of rock-work, with a few chinks or crannies for retirement. These materials should be well boiled to destroy any undesirable growths. The plants needed may be selected somewhat widely from aquatic growths. Some will root in the gravel; others, like duckweed, will float at large.

A few fresh-water snails are all the mollusks needed. For fish, almost any of the smaller kinds will do. The perch can be tamed to take food from the hand. The sticklebacks are interesting from their nest-building habits, but they are such fighters that it is necessary to keep them by themselves. The smaller fishes may be fed with insects, tiny bits of meat, and bread crumbs; the larger occasionally with minnows. Worms are useful, and sometimes the only food available. Of other aquarium animals. the newts are pretty and interesting, swimming about with their olive bodies, or sometimes basking on the rock.

Keep only a few kinds of fish and other animals together. If scum collects, clean it off, or add another snail, which will do the work of an extra scavenger. If the inmates look sluggish and poor, replace some of the water and aerate it well. See to it that a good supply of insects and small worms is put in as food; water-fleas, small larvæ, etc., may be given freely. Take out at once

any *large* dead or decaying thing. If all goes well, you need add only some rain-water now and then, to supply the loss by evaporation.

House Plants and Flowers.

Interesting as many of the cage-birds and other house pets are, the window conservatory and the flowering plant are of more value for home adornment, on account of the much less care needed, and their striking beauty when in bloom. The plants which can be used for house adornment are very numerous. We do not need to go to foreign lands in search of them, for they grow and bloom all around us. Many of the wild flowers of our fields and forests respond well to the loving hand of their admirer, and the ferns which are abundant in dell and ravine will fill up with attractive green many spare nooks in garden or on window-shelf.

The flowers raised in pots for house use are greatly varied in kind and character, including the favorite rose and lily, the constant-blooming geraniums, the azaleas, hyacinths, tulips, dahlias, and a great variety of others, too numerous to mention. Among them are many climbers which are very attractive when given an opportunity to drape an open space. Not only in the house, but in any bit of ground in its vicinity, green things can readily be kept in growth, bursting into rare beauty at some time in the year, when their period of bloom arrives.

Geraniums.

The geranium forms one of the most attractive of flowering plants from its rich hue and the fact that it keeps in bloom through a great part of the season. The cultivation of it is easy, almost any kind of soil answering the purpose. To set out a pot of geraniums, a small quantity of sand should be mixed with the soil, and some good manure added. The plant being well set in the earth, it should be watered, left for several days in a cool and shady spot, then put for a few hours in the light. In a short time it will become accustomed to the sunshine.

When the warm season comes, the pots can be set out in the ground, being buried to their tops. A cloudy day or late afternoon should be chosen, so as to avoid too much sunshine at first. To keep the geranium in attractive condition, decaying leaves and fading flower-heads should be removed, so that the plants may look always fresh. Slips will root well if set in the earth where shaded from the direct rays of the sun. They should be set well down and the earth pressed compactly around them. In this way fine young plants can be got ready for the winter flower garden.

Sweet Pea.

This is one of the most beautiful of the summer-garden flowers, from its great variety of color and abundant bloom. It has also the charm of a sweet perfume. It supplies many shades of colored bloom—white, rose, scarlet, purple, and variegated. Each variety should be planted separately, and several feet from any other plant. When support is required by the growing plant, a light rod will serve the purpose. The seed should be sown in rich ground in the early spring, the plant growing five or six feet high, and blooming from July to October.

In city gardens, indeed, it often proves difficult to cultivate, it being subject to the attack of minute insects which are almost impossible to eradicate. While in some gardens it grows freely and blooms profusely, in others it sadly fails, all efforts to destroy its enemies proving without avail.

Azalea.

The azaleas are easily cultivated, being very hardy, and form very attractive plants. They come in many colors and also striped, spotted, or otherwise variegated. They need a light soil of sandy loam, to which leaf-mold should be added. The foliage requires showering once a week, but the roots will rot if overwatered. Flower stems form in the new wood of each summer's growth, so that the amount of bloom is apt to depend upon the annual quantity of new wood. The plants are set out in May, and need to be taken up in early autumn. They do best in the house in a temperature varying from 40° at night to 70° in the daytime.

Hyacinths and Tulips.

The hyacinth is an easily-cultivated plant, of which more than a thousand varieties are grown in Holland, forming an important item of that country's export trade. All Europe and the United States are supplied with bulbs from this source. These should be set out in October or November, the finer sorts in beds, the common kinds as border plants. They will bloom in April, and may be kept in bloom for nearly a month. No watering is needed, but they must be kept free from weeds and supported with small sticks as they increase in height. They form a rich garden ornament, varying through every shade of red down to white, from blue to almost black, while some few are of yellow color.

The brilliant tulip is also a plant largely grown and yielding many varieties in Holland, in which land it has been famous for centuries. The bulbs should be planted in October or November, being set about four inches deep and four to six inches apart. They need a protective covering in case of severe frosts. They bloom in early spring, making a brilliant display with their gay and rich hues. There are both early and late bloomers, so that a tulip border may be kept in fine appearance for a considerable period. They succeed well in ordinary garden soil, and, with the hyacinth, make a very showy spring floral display. After the period of bloom, they can be taken up and stored until autumn, other plants taking their places.

Pansies.

The heart's-ease, or pansy, is a favorite with every one, from its beauty of color and the great variation alike in the form and tint of its flowers. These make their appearance early in the spring, and will continue to bloom till the time of frost comes again. They reach their finest bloom in May and June, wilt somewhat under the summer sun, but regain their beauty in autumn.

In planting pansies, a spot with a north aspect should be chosen. Soil of medium texture and not overfertilized is best. The soil should be kept loose around them, and care be taken to see that the border is free from the wireworm. By setting out the plants in September they become well bedded before winter, and seem to do as well as those kept in frames. Their propagation is easy, and young plants can be depended upon for the following season's beds. Seeds, if saved, should be taken only from choice flowers; in this way alone can improved varieties be obtained.

Verbenas and Petunias.

The verbena is a South American plant, which will bloom with us, in the open air, from May to November, its brilliant scarlet flowers having no superior for rich show. Endless varieties have been produced by cultivation, their tints running through every shade except blue and yellow. There are every shade of red, scarlet, crimson, purple, rose, etc.; also scarlet and purple, white with red eye, and various other pretty combinations.

The plant is a creeper, taking root freely wherever the stems come into contact with the ground. It is difficult to keep it through the winter, except in the house or conservatory, none of the roots being quite hardy enough to stand the wintry chill. Yet it continues to bloom after frost, and is one of the last lingering flowers of the fall. It can be easily reproduced from plants to be had at any greenhouse, and also from seed, which, if sown in May, will yield bloom in August. No plant surpasses the verbena for mass effect, when grown in beds cut out on lawns, where the brilliant flowers contrast finely with the green grass.

The petunia is another plant which blooms throughout the entire season, even after severe frosts. A bed of petunias will be profuse in flowers, varying widely in color and markings; some single, others double, occasionally as large and full as a rose. There are three classes, the grandiflora, the small-flowered, and the double, the small-flowered being the most common. It is the latter that add so much to the beauty of our gardens by their great variety of hue.

The Lily and Rose.

Of the lily there are numerous widely-varied species, many of them well known, many others rarely seen in gardens. It

grows from a bulb, and will do well in any well-protected bed. To develop it in perfection the soil should be dug to a depth of a foot and a half, filled to a foot with swamp muck and leaf mold or fresh manure, and the hole filled with six inches of peat and rich mold. The bulbs should be planted four or five inches deep, or, of the weaker sorts, three or four inches. Most of the species are quite hardy, but it is advantageous to cover them with a deep compost before winter.

The cultivation of the rose needs no special directions. The plants, once rooted, last for years, and bloom freely with little cultivation; some once only in the season, others continually. They are nearly all hardy, though many require some degree of winter protection.

North America has furnished our gardens with various handsome flowers, among them the large and beautiful dahlia, whose very numerous varieties, more than two thousand in all, have been derived by cultivation from two species of Mexican plants. The neat grace and perfection of their floral forms and great variety of shades of scarlet, crimson, purple, red and yellow, give them a special adaptation to floral borders, where they lift their trim heads with an air of pride. No plants surpass these in their inclination to sport into new varieties. The dahlias are generally cultivated by the division of the tuberous roots. These will not bear the frosts of northern climates, and must be taken up as soon as frost blackens the tops and kept for winter in a dry and sufficiently warm place.

Another handsome garden plant of North American origin is the familiar and favorite phlox, which bears its flowers in terminal panicles. The original form, once much grown in our gardens, is now rarely met with, the showy phloxes of to-day being all hybridized varieties, the production of the florists. They are highly ornamental in character. One species, the *drummondii*, has sported into a variety of beautiful colors, and is one of the most showy of cultivated annuals.

Among the wild flowers of the United States the most magnificent when in bloom is the rhododendron, which forms impenetrable thickets in many parts of the Alleghanies, and, with its related plant, the mountain laurel, gives a wonderful charm in the floral season to the Appalachian mountain glens, from Maine to Georgia. The cultivated rhododendron is produced by hybridization between the American and several Asiatic species,. In the hands of the florist it has attained a wonderful exuberance of form and color, the highly-cultivated varieties being unequaled for richness of hue and showiness and profusion of petals. It is a hardy plant, and will winter out of doors, calling for no special care or cultivation. This, of course, does not apply to the floral monstrosities annually exhibited, as results of the exaggerated care of flower fanciers.

We have named here only a few of the better known of an innumerable variety of flowers, very many of which are adapted for house cultivation or garden growth; but, as their treatment does not vary greatly, and in special cases must be learned largely by experience, we shall say no more here upon this attractive subject.

THE LATEST DISCOVERY IN SCIENCE

Radium, the rarest of all elementary substances, is worth about three thousand times its weight in pure gold. It looks like ordinary table salt. Its discovery was made near the close of 1903 by Professor and Mrs. Currie, of Paris. This picture shows Professor Sir W. Ramsey, explaining to Professor Currie, how radium changes to another substance called helium.

BOOK V

THE HOME CYCLOPEDIA

OF

HEALTH AND MEDICINE

A HOUSEHOLD GUIDE FOR THE PRESERVATION OF HEALTH, FOR THE CARE OF THE SICK, FOR RECOGNIZING DIFFERENT DISEASES, AND FOR PRESCRIBING THE SIMPLEST AND BEST REMEDIES—WHAT TO DO IN ACCIDENTS, POISONING AND EMERGENCY CASES—DIRECTIONS FOR ASSISTING THE SKILLFUL EFFORTS OF THE DOCTOR.

AN INVALUABLE AID IN THE SICK ROOM

By

HENRY HARTSHORNE, M. D.

Formerly Professor of Hygiene in the University of Pennsylvania, and Professor of Physiology and Diseases of Children in Women's Medical College of Pennsylvania; Author of "Our Homes." "Essentials of Practical Medicine," Etc., Etc. Editor of The American Edition of "Reynolds' System of Medicine."

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THE FAMILY DOCTOR

CAUSES, NATURE AND SIGNS OF DISEASE—CLASSIFICATION OF DISEASES —THE BEST REMEDIES—RELIEVING PAIN—PRINCIPAL MEDICINES —NURSING AND CARE OF THE SICK

—BY—

HENRY HARTSHORNE, M.D.

WHAT IS DISEASE

It was a rather strange idea of a recent distinguished writer upon Hygiene, that perhaps, if we understood perfectly all the laws of health, and obeyed them all, life might be indefinitely prolonged. Nature around us pronounces otherwise. Every tree, though it live a thousand years, withers, root and branch, at last. All the animals, from the long-lived elephant and tortoise down to the *ephemeral* insect floating on the breeze, have set terms of life. On this globe of ours, whatever organism is born, dies. *Man's body* furnishes no exception; his spirit, only, is immortal.

The marvel is, that so delicate a mechanism as the human body can survive for a single year, amongst the various perils that surround it. Yet we live on, some of us, accidents apart, for a good while. Most persons fail to reach advanced age, because of disease. What is disease?

It is *something either being or acting wrong in the body*. There may be as many kinds of disorder, or disease, at least, as there are organs of the body. *More* than that there really are, however; because *complications* of diseases occur, and each organ, or the general system, may be out of sorts in a large number of different ways.

First, it will be well for us to consider what makes the body, or parts of it, get out of order.

Causes of Disease.

These may be stated together, thus: as causes which are

Hereditary: examples (though *not always* inherited), consumption, gout, epilepsy, cancer.

Functional: that is, depending upon the action, either too great or too little, of one or more of the organs, or of the body generally. Examples: over-exertion, over-excitement, loss of sleep; or, on the other hand, want of exercise.

Mechanical: as wounds or injuries of various kinds, tight-lacing, etc.

Conditional: as extremes of heat or cold, sudden changes of temperature, dampness of dwellings.

Digestive: as poisoning, unwholesome food, intemperance, abuse of medicine; and, on the other hand, starvation.

Obstructive: as neglect of the bowels, uncleanliness of the skin, ill ventilation.

Contagious: as small-pox, itch, hydrophobia.

Atmospheric: as autumnal fevers, yellow fever, cholera.

Hereditary Disease.

We often see consumption affecting several members of the same family through several generations. The same is true of insanity. Gout is many times transmitted from father to son, but seldom to a third generation. Epilepsy, also, does not often extend to grandchildren, nor does cancer. Each of these diseases may come *without* inheritance. Then, we can sometimes, though not always, find at least a partial explanation of their origin otherwise.

Not all (if there be several) children in a family are likely to have the inheritable disease. Perhaps all may escape it; now and then it comes again in *their* children, having skipped a whole generation.

Children are not *born* with transmitted diseases; except syphilis, among those of real constitutional inheritance, and a few of the *contagious* affections. They are commonly affected with them about the time of life when their parents were so. Thus *scrofulous* disorders of the eyes, ears, skin, glands, and bones, are apt to show themselves in childhood; *consumption* of the *lungs*, in youth or early maturity; *gout* near middle age; *apoplexy*, and *disease of the heart*, from fifty to seventy years; early *deafness*, or *blindness*, at various periods in different families.

Sometimes the inherited taint is *modified* in transmission. Thus the children of a gouty person may have, not regular gout, but neuralgia; and the offspring of one who is insane may have inflammation of the brain, or convulsions, etc. Children of *intemperate* parents are very likely to have some impairment of their nervous system, and often die in infancy.

Besides these special transmissions of tendencies to disease, there is a gradually degenerating influence in families, and even whole populations, from *unhealthy living*. It is most observed in large cities.

Functional Causation.

Over-exertion may produce exhaustion, which, in a person before feeble, may end in death. Or, short of this, there may be brought on a state of weakness slow to be recovered from. In such a state, moreover, the body is less capable of resisting all causes of disease than when in full vigor.

Excessive efforts may, at the time, strain muscles, or even burst the heart, or the great main artery, the aorta.

Over-excitement of the brain is, in many cases, when it lasts but for a short time, followed simply by exhaustion and gradual return, through repose, to ordinary health. But long-continued excessive mental excitement may produce either *inflammation of the brain*, *insanity*, or prolonged *brain-exhaustion*. Loss of sleep, however induced, endangers such effects. Hardly any one can survive deprivation of sleep for so long as two weeks at a time; a single week would finish most peoples' lives.

Mechanical Injuries.

Broken limbs, displaced joints, and wounds, are often causes of disease. Tight-lacing is also a mechanical cause of interruption to the right action of the lungs and heart, crowding these and other organs into too small a space. *Position* of the body acts mechanically, sometimes, in promoting certain maladies. Whoever is predisposed to apoplexy, is especially liable to have an attack while stooping, or lying with the head low.

Conditional Causes.

By these we mean high heat, great cold, dampness, sudden changes and partial exposures of the body to either extreme, or electrical influences; these last being very little understood.

Sunstroke is a familiar accident in warm climates. *Cold-stroke* is less common, but I have known it to be almost as sudden as the opposite. *Continued heat* predisposes to disorders of the *liver*, *stomach* and *bowels*. *Cold*, with *dampness*, promotes affections of the *lungs* and other organs within the *chest*.

Catching cold: what is it? For example; one comes in warm from exercise on a spring or autumn day, takes off his coat, and sits down near a window to "cool off." His skin is relaxed and moist with perspiration, whose evaporation, under the window-breeze, goes on rapidly. Suppose the breeze to blow on his back, between his shoulders. That part is cooled more than the rest of his

body. Its blood-vessels and skin-pores contract under the cooling process, detaining the perspiration and driving the blood inward from the surface. Some of the waste matter which the skin would have thrown off by sweating, but for this chilling, is now kept in the blood.

The result may be made more serious than a mere cold. If there be a weak or susceptible part within the chest (bronchial tubes, lungs, pleura, or heart) *it* suffers from overloading with blood and waste material; and we have a *bronchitis*, a *pneumonia*, a *pleurisy*, or an *inflammation of the heart*. Among these, the first is the most frequent, and the last the least so; but even it does sometimes happen, especially in a rheumatic person.

Digestive Morbid Causes.

Excess of food may cause indigestion at the time; and, if often repeated, habitual indigestion—called *dyspepsia*. A less amount of excess or superfluity may bring on an overfulness of rich blood in the system—*plethora*. Deficiency of food weakens, and so promotes attacks of many disorders; varying according to constitution and exposure.

Indigestible articles may produce common *indigestion*, with windy pain in the stomach, nausea, etc.; or *cholera morbus*, which is much more severe; occasionally dangerous.

Obstructive Causes.

Everything that interferes with the clearing out from the body of all waste and dead material, by the excretions, tends to injure health. Breathing foul air, makes the blood impure, and promotes diseases of various kinds. Uncleanliness of the skin acts in the same way to a less certain and serious degree. Neglect of the bowels leads to costiveness, headache, and dyspepsia; now and then it brings on *hernia* (rupture) which may endanger life, or an obstruction of the bowels within the abdomen, from which not many who suffer it recover.

Contagion.

This is, strictly defined, conveyance of disease by touch or contact. But some (not all) disorders, which may be transmitted by actual touch, pass also to a short distance through the air. This is true of typhus, small-pox, chicken-pox, measles, scarlet fever, mumps, and whooping-cough, certainly; perhaps, in rare instances, of diphtheria. Hydrophobia, syphilis, and gonorrhœa are conveyed only by contact and *inoculation;* that is, introduction of the virus of the disease into the blood, or, at least, under the skin. These diseases, are, in fact, the common diseases that are *certainly* contagious.

Infection: Atmospheric Causation.

Certain places, at particular times, are infected with maladies which attack a greater or less number of those living or visiting there. Some of these diseases are said to be endemic; that is, they are limited to quite clearly defined places. Thus, *ague* or *malarial fever* and autumnal bilious or *remittent fever* are found to prevail in some neighborhoods every fall and spring; while other places, perhaps not more than a mile distant, are clear of them. *Yellow fever* is an endemic disease of the vicinity of the sea-coast of Cuba, while the higher regions of the same island are free from it. *Cholera* is endemic only in Hindustan, near the banks of the Ganges River.

When these, or any other diseases, overpass limited places, and appear in many localities, they are said to be epidemic. Yellow fever is often epidemic. Cholera, once in several years, starts out from India, and travels mostly westward.

Plague was once universally, and is now generally, believed to be extremely contagious.

Erysipelas and *puerperal fever* cannot be positively said never to be extended from one person to another. *Diphtheria*, likewise, is sometimes given by one person to another; Usually, however, diphtheria is either a local endemic or a slowly migrating epidemic disorder.

Influenza is always an epidemic; nobody imagines it to be contagious from person to person. The same rule is also of *dengue*, the "breakbone fever" of the Southern States, and of a form of *dysentery* prevalent during the summer and autumn in some localities.

NATURE OF DISEASES

Children sometimes die of old age. That is, their *original endowment of life energy* was so small as to be exhausted during infancy. Others die very soon because of some *defective development of a vital organ* or organs.

At any period of life the disorders to which we are all subject consist in one or both of the following changes:

1. Disturbance of the *action* of some organ or organs by a morbid cause.
2. Alteration of the *structure* or *substance* of one or more organs; inducing, of course, change also in its action.

To the first of these the term "functional disorders" is applied; those of the second sort are "organic diseases." *Temporary* changes in the substance or structure of an organ often occur, as when it is *inflamed*, from which there may or may not follow permanent organic alterations.

Only *slight* affections of even small parts of the body can take place and last for any time, without involving the general system more or less in disturbance. Also, a disorder beginning in the blood, and thus being a *general* malady, nearly if not quite always puts some of the functions of the organs out of order. Still some cases do begin in, and chiefly affect, particular organs; these we call local disorders; others begin in the blood, and involve the body in many of its functions; those are well described as general diseases. We will give attention here, first, to the nature of the disturbances coming under the former of these heads.

Local Disorders.

Medical books speak of irritation, congestion (*hyperæmia*), inflammation, mortification, and degeneration, as affections of organs of the body, Atrophy, hypertrophy, and morbid growths are such also; and less purely local, but often more or less restricted, are dropsical effusions.

Irritation.

An eye is *irritated* when a spark from a locomotive, or a bit of sand, or an inverted eyelash, get into it. A mustard-plaster first stimulates the circulation of the skin where it is applied; this may be quite within the bounds of healthy action, if the mustard be soon withdrawn. If it remain longer, *irritation* is shown by *pain* and *soreness;* next, if still allowed to act, it will produce *inflammation*. Irritation of the stomach may be caused by indigestible food, or, more serious in degree, by certain poisonous substances; as strong acids, alkalies, arsenic, or corrosive sublimate.

Congestion (or Hyperæmia).

This may be an *active* flowing of more blood than common *through* a part, or a *passive* collection of blood *in* the part. Stimulation produces the former; when it passes beyond the line of health into irritation, passive congestion occurs at the centre of the irritation, active congestion in the parts around it. Determination of blood towards any portion of the body may be, when very decided, called *local hyperæmia*. A *bloodless* condition of an organ is called a local *anæmia*. This first simply means *excess* of blood; the second, *deficiency* of blood.

Inflammation.

All the world knows when a hand, a foot, or an eye is *inflamed*. Proverbially, the signs of this are *redness*, *heat*, *pain*, and *swelling*. The redness is owing to the excess of blood; the heat to the same cause, with also probably some increase of chemical change in the part. Pain is not quite so clearly to be accounted for. Pressure on a nerve is known to cause pain; and the excess of blood beating on a part at whose *centre* is *stagnation*, must induce considerable pressure. Nerve-pain (neuralgia), however, often occurs without inflammation and without pressure. Some one has wisely said that pain is always a sign of a tendency in the part towards death. It is, at least, indicative of *lowered vitality*, local or general; and that is present at the *centre* of an inflamed organ, while *around it* there may be the heightened activity of stimulation. In a *boil*, and yet more fully in a *carbuncle*, we see the *dead centre* (core) of the violent inflammation, when its force is nearly spent.

The *swelling* of an inflamed part is due in considerable degree to the accumulation of blood in it. But, under the pressure of the heightened circulation, some of the *lymph* (watery portion) of the blood escapes from the blood-vessels into the substance of the part. This undergoes changes, which are important.

An active or *acute* inflammation may end in several ways:

1. RESOLUTION is the early passing off of all the inflammatory symptoms, leaving almost no sensible change in the part.

2. EFFUSION OF LYMPH, not at once absorbed, shows itself in bands which glue together tissues naturally movable, or in a collection of fluid (serum), constituting a form of local dropsy. In an attack of pleurisy, both of these results may follow instead of resolution.

3. SUPPURATION is the formation of pus; that is, yellow matter, which is very seldom absorbed, and whose best destiny is to be got out of the body by an opening, natural or artificial, at or near the external surface. Every "gathering" or abscess is an example of this. *Pyæmia* is a general disorder of the system, with a disposition towards the formation of collections of pus in different organs, with fever and much weakness, endangering life.

4. MORTIFICATION, also called *gangrene*, or *sloughing*, is the actual death of the part. Frozen feet mortify, not from inflammation, but from the directly killing effect of cold. Inflammation does not often end in mortification; if it does so, it is either from the extreme intensity of the inflammatory process, or from a very low vital condition of the patient affected.

Inflammation is modified considerably by specific causes of disease. A gouty toe is one example of this; a wrist or elbow inflamed with rheumatic fever is another. The sore throat of quinsy, that of scarlet fever, and that of diphtheria, are all *inflammations*, yet each somewhat different from the others. The pustule of vaccination and that of genuine small-pox are not precisely alike; and still different is that of chicken-pox; and so on with other specific diseases.

Chronic inflammation is not a desirable term, though it is used in all medical books. In it, redness, pain, or at least soreness, and more or less swelling, are present, in varying degrees; but there is no *effusion of lymph*, which really is the characteristic of a true inflammation. *Irritability* is a usual part of what is called chronic inflammation; we might often with advantage speak of this in describing the disorder: thus, irritable eyes, irritable stomach, irritable bladder, irritable womb, irritable brain, etc.

Hypertrophy or Overgrowth.

Overgrowth is the meaning of this word; increase in size without essential change in the nature of a part. An organ may enlarge very much, with a great change in its character; for example, a tumor of the breast, or a dropsy of the head. Again, an organ may be stretched or dilated without even an increase of its substance.

The heart exemplifies two of these changes in different instances. If one of its valves through which the blood passes becomes obstructed from disease, the heart has to *labor* more than usually to compel the blood to pass by the obstruction. Like other muscles (the heart being really a hollow muscle), this extra labor may have either of two results, according to the conditions present. If the person's constitution be strong, and his blood well nourished, the much-worked heart will grow thicker and more powerful with the exercise. This is *hypertrophy*. But, if the contrary be the case, with a feeble system and poor blood, the heart is weakened by its excess of labor, and it stretches or becomes thin (attenuated) and dilated.

The thickening of the skin of a working-man's hands shows an increased growth from habitual rough usage. A *corn* is a hypertrophy, and so is a *wart*; both involving almost entirely the outer skin or cuticle. *Wens* and *pimples* show a greater change of substance with enlargement.

Atrophy and Degeneration.

Atrophy is the opposite to hypertrophy. Want of blood or of the supply of nervous energy will cause an organ to shrink away. So a palsied hand often, in time, withers to half its original size. Atrophy occurs

naturally, all over the body, with old age. First the fat is absorbed, then the muscles, and afterward other parts.

Degeneration.—Instead of lessening in size, however, from loss of life-force, an organ may grow larger, with change of substance. This is *organic degeneration*. The substance taking the place of the natural tissue of the part is always inferior in character to that tissue. Thus *fat* may take the place of *muscle*, as in "fatty degeneration of the heart." Or bone-like material may form in place of the proper substance of the arteries; making "ossification" of those vessels. Or the liver or kidney may be enlarged, the normal cells of either organ being replaced by a material like the areolar ("cellular") tissue of the surface of the body under the skin. Tubercle, of the lungs or other parts, is essentially a kind of degeneration; although it often follows attacks of inflammation. Acute and chronic inflammation of various organs is frequently followed by hardening or softening; both of these being modes of degenerative alteration.

Dropsy.

Seldom does an accumulation of water occur in one part of the body without some previous general disorder of the system, or at least an affection of some of the great organs: the *heart*, *liver*, or *kidneys*. We do sometimes meet with "white swelling" of the knee; but nearly always there are also signs of a "scrofulous" constitution to predispose to it.

Inflammation may, however, cause an effusion of serum, which remains after the acuteness of the attack has passed. The simplest illustration of this is seen in a *blister*.

Suppose mustard to be applied to the skin. First, we see *stimulation* shown by redness and heat, with very little if any swelling, and no pain. Next, *irritation*, with soreness and pain, perhaps quite severe; then *inflammation*, followed by *effusion*, which raises the skin into what we call a "blister."

So, also, when the pleura, which lines the ribs and wraps the lungs, is inflamed, it throws out in a few days more or less lymph, as an effusion. If this is copious in amount, it presses the lung away, and interferes with its expansion in breathing. This is sometimes so serious a trouble as to induce physicians to *tap* the chest and draw off the water to relieve the oppressed lung. Likewise, inflammation of the covering of the heart (*pericarditis*) may result in a serious effusion within the pericardial sac, clogging the heart so as not infrequently to cause death. *Hydrocephalus*, or water on the brain, may originate in a similar way.

Dropsy of the chest, however, dropsy of the head, dropsy of the abdomen (*ascites*), and general dropsy, are much more often brought on by obstruction of the circulation, with thinning of the blood, from disease of the *liver*, *kidneys*, or *heart*, or two or more of those organs at the same time. *Ovarian* dropsy attends a disease of one or both of the ovaries.

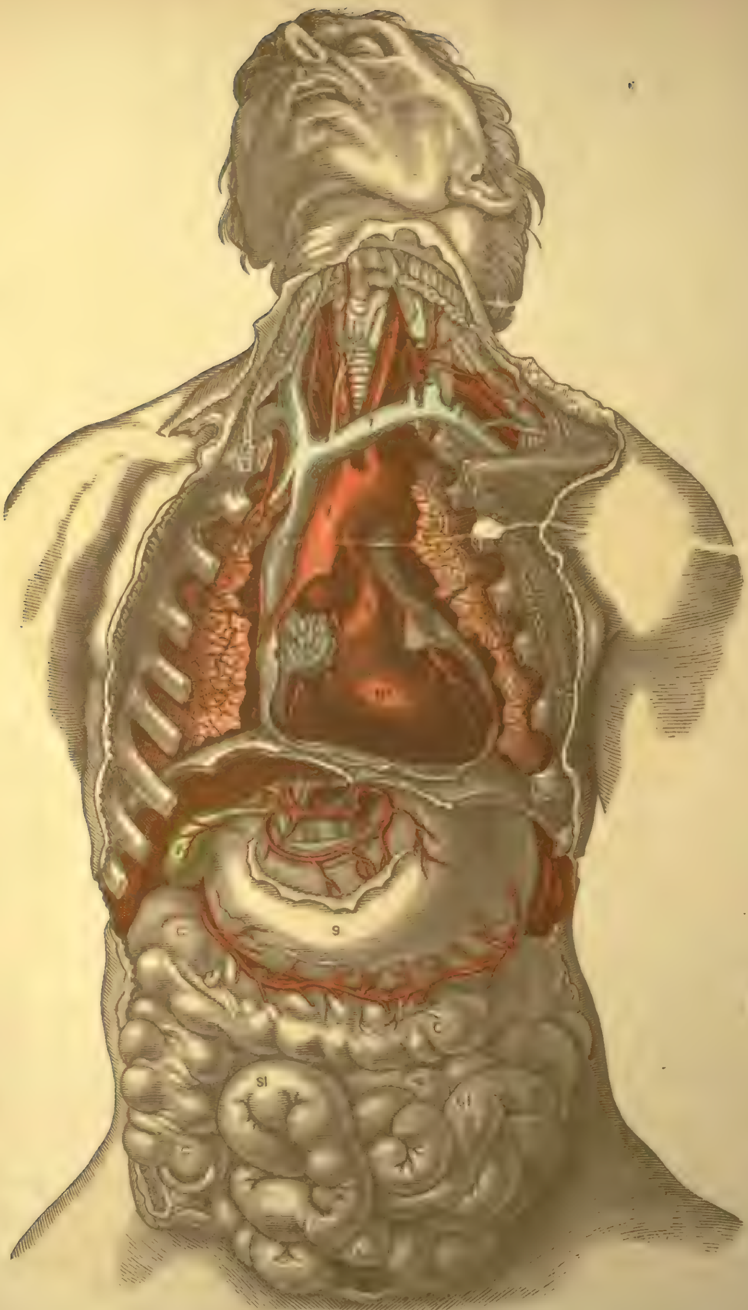
Œdema is a watery swelling of a part of the surface of the body or limbs.

EMPHYSEMA is a puffiness of the skin, or lungs, from accumulation of air in the cellular substance of the part affected.

Mortification.

When a part, as a toe, a whole foot, leg, or arm dies, while the rest of the body lives, it is said to *mortify*, *slough*, or suffer gangrene. Once in a while the feet of an old person may undergo slow and dry gangrene. When an artery, as that of an arm, is plugged up by a clot, the arm is apt to mortify in consequence. Frozen feet or toes often die and slough off. Sometimes, especially in ill-ventilated hospitals, stumps of amputated limbs, and wounds of various kinds, *slough* instead of healing (hospital gangrene). Quite rarely, *sore mouth* in children may become gangrenous; and even a lung, or a portion of it, may become the seat of gangrene. In the last case, the patient is almost sure to die.

Mortification of a part is always more or less dangerous to the life of the whole body in two ways. First, the sloughing process may extend gradually from the part affected towards the centre of the body; and thus, *involving vital parts*, it may become fatal. Or dead matter from the gangrenous portion may be *absorbed by the vessels*, and so poison



ORGANS OF THE CHEST AND ABDOMEN.

1.	Aorta.	5.	Left Subclavian Artery.	H.	Heart.	C.C.C.	Colon.
2.	Pulmonary Artery.	6.	Vena Cava.	I.	Larynx.	S.	Stomach.
3	Innominate Artery.	7.	Left Vena Innominata.	L.	Liver.	SI.SI.	Small Intestines.
4.	Left Carotid Artery.	8.	Right Vena Innominata.	g	Gall Bladder.		

the blood (*septicæmia*) in a manner seldom recovered from.

When mortification is confined to a small part of the body, as a frozen toe or finger, the rest of the system being in a healthy state, a line of demarcation naturally forms, separating the dead from the living tissues. In some cases, a surgeon will then consider it best to hasten and complete the process; removing the sloughing part, by an operation. In other instances, the dead parts will drop off, leaving a surface which will gradually heal.

Morbid Growths.

Warts, *corns*, *bunions*, *wens*, *moles*, *bony enlargements*, *fibrous and fatty tumors*, are all unsightly, and the last named may be considerably inconvenient. But they do not of themselves tend to undergo such increase or morbid changes as to be dangerous to life. They may therefore, by comparison, be called *innocent* growths.

MALIGNANT tumors are generally included under the name *cancer*. They tend to grow indefinitely, at the expense of the neighboring parts and of the general system. They often change their character, becoming open, discharging, offensive sores; the seat, moreover, generally of severe pain. At last, the whole body of a cancerous patient becomes unhealthy; and the end, after various periods, is death.

Cancers may be either *schirrus*, *colloid*, or *encephaloid*. *Schirrus* is hard *cancer*. *Colloid* is jelly-like. *Encephaloid* is soft, almost like brain substance.

The parts of the body most liable to be attacked by cancer (especially after middle life) are the womb, the female breast, the stomach, and the lower bowel (*rectum*); but various other organs are sometimes invaded by it. *Schirrus* is most apt to be met in the breast, stomach or bowel; *colloid*, in the stomach, bowel, or covering of the bowels (*mesentery*, *peritoneum*). *Encephaloid* may occur in any organ; it is the only kind ever seen in the eye, liver, kidney, lung, etc.

GENERAL DISORDERS

We may name these as *debility*, *anœmia*, *plethora*, *cochexio*, *neuratoxia*, *toxœmia*, and *fever*.

Debility.

One is apt to feel *weak*, when anything whatever is the matter. This may arise from loss of blood, from excessive fatigue, from continued illness, or from a severe shock to the system from any cause. Either of these may cause depression or prostration, of which the extremest degree is called collapse.

In the beginning of all such affections, the weakness is that of oppression. The organs of the body are *clogged*, so to speak; skin, kidneys, bowels, etc., are, for the time, hindered in their action, and the loaded blood fails to stimulate aright the various functions,

It is important, in treating debility, to distinguish of what kind it is. *Exhaustion*, as after long illness, is to be recovered from, with time, under nourishing food, rest, pure air, etc. *Depression*, or prostration, as from a severe shock, by warmth, rest, and stimulation, according to the nature and degree of the case. *Oppression* of the organs, at the onset of a disease, is best relieved by unloading the system with purgative medicines, and those which promote the action of the skin and kidneys; sometimes, in an early stage, by the withdrawal of blood from the arm, or by leeches or cups from a central part.

Anæmia and Plethora.

Poverty of blood may result from various diseases, or from loss of blood, too long nursing, etc. Weakness accompanies it, of the kind above called exhaustion. An anæmic person is usually pale (though perhaps easily flushed by excitement), rather thin, and "nervous." There is a form of this disorder called progressive pernicious anæmia, which cannot be accounted for by ordinary causes, and which it is almost or quite impossible to cure by any treatment.

Plethora is the opposite of anæmia. In it, the red corpuscles of the blood are too numerous, and the blood itself is redundant in amount. A plethoric person is round and plump (not necessarily *fat*), with full blood-vessels and a high color. Such an one is

more liable than others, in early life, to *acute inflammations* and *active hemorrhages;* after middle age to *apoplexy*.

Cachexia or Diathesis.

By this is meant some abnormal condition of the constitution.

Leukæmia (or leucocythæmia) is a disease in which there is an *excess of white or colorless corpuscles* in the blood.

Another *cachexia* is *scurvy* (scorbutus); brought on by deficiency of fresh food; especially of vegetable food.

Another is *goitre or bronchocele*, whose main feature is a swelling in the neck, involving the thyroid gland.

Chlorosis, or "green sickness," is a cachexia sometimes met with in girls or young women; the name is given because of a peculiar sallowness of complexion belonging to it.

Rickets occur tolerably often among the ill-fed poor in the cities of Europe; much more seldom in this country. Those having it are feeble from childhood, with defective development especially of the bones; which are easily broken and subject to decay.

Tuberculosis is the constitutional affection of which consumption of the lungs is the most familiar manifestation; but it often also affects the bowels, brain and other organs. *Tubercles* are the small, irregular, roundish deposits found after death in the place of healthy tissues; which, however, frequently soften, leaving cavities. *Tubercular meningitis* is the name given to an almost always fatal form of inflammation of the membranes of the brain, in children.

Scrofula is an old designation for a constitutional tendency showing itself early in life, by swelling of the glands of the neck and elsewhere, sore eyes, sore nose, running at the ears, and sometimes inflammation and decay of the bones of the limbs, or "white swelling" of the knee.

Toxæmia: Blood-Poisoning.

Blood-poisoning can never be a trifling thing. We should be in deadly danger of it every day, but that so much is arranged in our bodies not only to prevent it, but to relieve it promptly when it begins to take place. Indeed, each particle of used-up matter, which has served its purpose in any organ, becomes poisonous the moment it gets into the blood. But then, at once, the lungs, skin, kidneys, and bowels, with help also from the liver, take from the blood these dead particles, and carry them out, in the exhaled breath, perspiration, urine, and excrement.

There are several forms of blood-poisoning, due to suppression of the action of the kidneys, nonsecretion of bile by the liver, or to retention of putrefiable matter not carried off by the bowels.

Next to these may be named *septicæmia*, produced by the absorption of foul material from a surface of the body, or near it; as from a gangrenous wound or an unhealthy abscess. *Outside* poisons reach the blood through the mouth and stomach, by the lungs, or by the skin, as by *bad drinking-water*, and the microbes of malaria, small-pox, scarlet fever, yellow fever, cholera, etc.

Fever.

When one has a hot, dry skin, a glowing red cheek, thirst, a rapid pulse, and weakness of body, with more or less dulness or disturbance of the mental faculties, we say he has *fever*. Constipation of the bowels, and scanty secretion from the kidneys, also commonly belong to the same condition. But of all this group of symptoms, the most constant is *heat*. In health, a thermometer in the armpit will mark 98.5° Fahr. Fever often runs it up to 103°, 104°, 105°, or even higher still.

Fever is met with in connection with many diseases. Inflammation of any of the great organs, brain, lungs, heart, pleura, bronchial tubes, stomach, bowels, etc., will, when active, be attended by it. And, without any inflammation, we meet with it in typhus; also with inflammatory affections secondary to the general disease, in scarlet fever, small-pox, measles, diphtheria; and with or without local inflammations, in yellow fever, in relapsing, intermittent, and remittent fevers; perhaps also sometimes without any true acute inflammation, in typhoid fever.

CLASSIFICATION OF DISEASES

Various plans of arrangement have been proposed, and are in use. I prefer to name all diseases as either INFLAMMATIONS and TOXÆMIC disorders, CACHECTIC affections, NERVOUS disorders, or UNCLASSIFIABLE diseases.

Under the first head we place inflammatory attacks affecting BRAIN (meningitis*), LUNGS (pneumonia), PLEURA (pleurisy), AIR-PASSAGES (laryngitis, tracheitis, bronchitis), HEART (endocarditis, pericarditis), TONSILS (quinsy), THROAT (pharyngitis), STOMACH (gastritis), BOWELS (enteritis, colitis, dysentery), PERITONEUM (peritonitis), LIVER (hepatitis), KIDNEY (nephritis), BLADDER (cystitis), etc.

As TOXÆMIC disorders may be mentioned: 1. Those caused only by *contact* or *inoculation:* PRIMARY SYPHILIS, GONORRHŒA, HYDROPHOBIA, VACCINIA.† 2. *Eruptive*‡ diseases, which are *contagious:* SMALL-POX, CHICKEN-POX, SCARLET FEVER, MEASLES. 3. Allied affections to the above, but *not eruptive*, although contagious: MUMPS and WHOPPING-COUGH. 4. Diseases *generally epidemic or endemic:* TYPHOID FEVER, TYPHUS, SPOTTED (cerebro-spinal) FEVER, ERYSIPELAS, PUERPERAL FEVER, INFLUENZA, DIPHTHERIA, PLAGUE, and CHOLERA. 5. *Endemic* and *occasionally* epidemic; YELLOW FEVER, RELAPSING FEVER, and DENGUE. 6. Endemic and "*malarious*": INTERMITTENT, REMITTENT, and PERNICIOUS (congestive) FEVER.

Of CACHECTIC affections, a part of the long list will answer our purpose here. 1. Those which are always *chronic* (prolonged indefinitely, tedious, not tending to recover of themselves): ANÆMIA, CHLOROSIS, LEUKÆMIA, GENERAL DROPSY, TUBERCULOSIS, DIABETES, CONSTITUTIONAL SYPHILIS. 2. *Acute* or *subacute* (active, and of limited duration): SCURVY, GOUT, INFLAMMATORY RHEUMATISM, PYÆMIA, SEPTIC FEVER, (septicæmia), etc. 3. *Local* cachexiæ (degenerations): as CANCER, GOITRE, BRIGHTS' DISEASE (of the kidneys), FATTY HEART, GIN LIVER, etc. 4. SKIN-DISEASES.

* Nearly always this term applies; meaning inflammation of the *membranes* of the brain as well as of its substance.
† Glanders, sometimes taken from the horse, is another of this group.
‡ Physicians often call these *exanthemata*.

NERVOUS DISORDERS may also be only in part named here: APOPLEXY, PARALYSIS (palsy), EPILEPSY, CATALEPSY, HYSTERIA, CHOREA (St. Vitus's dance), TETANUS (lock-jaw), ASTHMA, ANGINA PECTORIS, LOCOMOTOR ATAXY (one form of spine-disease), CONVULSIONS, NEURALGIA, DELIRIUM TREMENS, (mania-a-potu) Insanity.

Of UNCLASSIFIABLE diseases, not easily fitting in either of the above groups, there are DYSPEPSIA, CHOLERA MORBUS, DIARRHŒA, COLIC, JAUNDICE, HEMORRHAGES, LOCAL DROPSIES, WORMS, etc.

Signs and Symptoms of Diseases.

On approaching a sick person, our first question, whether put into words or not, is naturally, *Is there much the matter?*

Other inquiries follow, such as these: Has he *fever?* Is he very *weak?* Is his *head clear?* Does he suffer *pain* anywhere? What *organ* or *function* of his body is not as it ought to be?

So we proceed from one thing to another in forming what doctors call a diagnosis of a case. Experience makes such an examination more and more easy, rapid and efficient. A besetting temptation, even with physicians, is, when enough has been found out to give a probable *name* for the malady of the patient, to conclude at once that this is the whole matter, and that we know *all about* his case. This cannot be true, however, unless we have carefully scrutinized *all* his organs, or at least have satisfied ourselves on good evidence as to the presence or absence of disorder in them all.

Our plan here makes suitable only a short account of the principal symptoms found in connection with different parts of the body, and their meaning; or, at least, the conditions with which they are most likely to be associated.

Symptoms Affecting the Skin.

The skin is hot and dry in fever.

Moisture is nearly always a favorable sign. Exceptions are, the *cold* and *clammy* perspiration of great prostration, and the *copious* sweating of *advanced consumption*.

EMACIATION (wasting) is seen generally in those long sick. Sometimes it occurs rapidly, as in severe diarrhœa, or in the summer complaint of children.

The color of the skin may be changed considerably in disease. The face is—

PALE, during fainting, with sick stomach, and in anæmic persons.

FLUSHED, in fever, early stage of apoplexy, or intoxication.

CHEEKS BRIGHTLY FLUSHED, in hectic fever of consumptives.

PURPLE or LIVID, in typhoid or typhus fever.

YELLOW, in jaundice, bilious fever, and yellow fever.

SALLOW, in chlorosis, dyspepsia, and cancer.

BLUE, in the collapse of cholera, and cyanosis.

BLACK, almost, in suffocation from any cause.

ERUPTIONS upon the skin belong to certain other diseases.

Symptoms Presented by the Mouth, etc.

The TONGUE is pale, in anæmic persons; red in scarlet fever, inflamed mouth, and sometimes when the stomach is inflamed (*gastritis*); furred, in indigestion, and very often in fever; brown, or black, cracked and fissured, in *low* fevers, as typhoid or typhus. It is pushed out with difficulty in low fevers, and after an apoplectic attack; going to one side, in paralysis affecting one side only.

The TEETH are covered with thick brown stuff called "sordes" in low febrile states. They are loosened, sometimes, by severe salivation, from large doses of mercury—(not now given by regular physicians).

The GUMS are swollen, soft, and spongy, and disposed to bleed easily in *scurvy*. A *blue line* along the gums is observed in lead-poisoning; a *red line*, occasionally, in advancing consumption. Swelling and soreness of the gums, with tenderness of the teeth and a "coppery" taste in the mouth, are signs of mercurial *salivation*.

Increase of saliva gives the name to this affection, once not uncommon in medical practice. *Iodide of potassium*, taken medicinally, will sometimes salivate. Large doses of *jaborandi*, or its active principle, *pilocarpin*, generally does so.

The TASTE is morbid bitter in disorder of the liver; sour, often, in dyspepsia, saltish, with spitting of blood; putrid in gangrene of the lungs.

The Throat.

DIFFICULTY of SWALLOWING may result from *inflammation* of the tonsils or gullet (*pharynx*); *spasmodic* closure of the throat; permanent narrowing or *stricture* of the pharynx or lower gullet (*œsophagus*); *obstruction*, as from a bone, etc.; *paralysis*, as after diphtheria, or extreme *weakness*, in the dying state.

THIRST is excessive in two opposite conditions: high *fever* and low *collapse*.

The Stomach.

APPETITE is almost always deficient in both acute and chronic disease; most so, however, in the former, as a rule. *Perverted* appetite occurs in case of *chlorosis*, and in some *hysterical* subjects.

NAUSEA (sick stomach), with or without *vomiting*, is met with in *indigestion*, *colic*, *seasickness*, *pregnancy* (morning sickness), *gastritis* (inflammation of the stomach), *hysteria* (occasionally), *cholera-morbus*, *epidemic cholera*, *bilious remittent fever*, *yellow fever*, *ulcer of stomach*, *cancer of stomach*, *strangulated hernia* (rupture), *obstruction of the bowels*, *irritant poisoning*.

Symptoms Belonging to the Circulation.

PALPITATION, or disturbed action of the *heart*, may depend upon *inflammation* of its *membranes* (*pericarditis*, *endocarditis*), *enlargement* (*hypertrophy* or *dilatation*), *valvular disease*, *anœmia*, with weakness, *nervous irritability* (nervousness), as from strong coffee, tobacco, etc., *dyspepsia*, *brain disorder*.

A FEVER pulse is moderately rapid, and in the early stages of an attack, strong; later, soft and compressible. When violent acute *inflammation* of any organ is present, it is quickened, *hard*, and rather full, as a rule.

A NERVOUSLY-DISTURBED pulse is quick (jerking rather than rapid), and variable, under excitement or repose.

In EXTREME WEAKNESS, most of all in the dying state, the pulse is nearly always rapid and small, or "thready." A pulse of 150 or 160 in a minute, is almost always a sign of death. Very rarely is the pulse slow in the dying state.

SLOWNESS of the pulse is most marked in compression of the brain (as in *apoplexy*, *fracture of the skull*, or *hydrocephalus*, *i.e.*, water on the brain), and in *opium poisoning*. Occasionally the pulse is very slow in cases of heart disorder.

IRREGULARITY of the pulse is natural to a small number of persons, at least in childhood or in old age, without other signs of

FEELING THE PULSE

disease. It may be, otherwise, a transient symptom, particularly during convalescence from a fever. It is distinctly related to disease present, in certain cases of *heart disease* (when it is serious) and in the third stage of acute *meningitis* (inflammation of the brain). Excessive *smoking of tobacco* sometimes produces irregularity of the pulse.

A *double* pulse is met with in many instances of *continued fever*, typhus or typhoid.

Slowness of the *capillary* circulation is occasionally shown, in morbid states, by the tardy return of the blood when displaced by pressure, as on the back of the hand or the cheek. In the *veins*, likewise, this is notably seen in the *collapse of cholera*.

Hemorrhage.

While bleeding from any part of the body is often an important symptom, it needs to be interpreted with care. Its consequence depends greatly on its *quantity* and the *source* from which the blood comes.

Thus, in bleeding at the *nose*, the flow of blood may possibly result from either of the following causes: a severe *blow; congestion* (fullness of blood) simply in the membranes of the nose; *congestion of the brain* (to which the bleeding may give advantageous relief); early stage of *typhoid fever; suppressed menstruation* (monthly discharge) of which it is an *alternative*.

SPITTING of blood may come from hemorrhage of the *gums*, the back of the *nostrils*, *throat*, *windpipe* (bronchial tubes), *lungs*, or *stomach*.

If from the *stomach*, it is preceded by *nausea*, and is *vomited*. When from the *lungs* or bronchial tubes, it is *coughed up* instead.

HEMORRHAGE FROM THE LUNGS (*hæmoptysis*) may depend upon *congestion* (overfulness of blood) of the lungs; *heart disease*, *tubercular consumption*, *suppressed menstruation*, of which it may, occasionally, be an alternative or substitute; an *injury*, as a broken rib, wound of the lung, etc.; *rupture* of an *aneurism of the aorta*.

VOMITING OF BLOOD may be one of the symptoms occurring in *hysterical* women; or it may result from *ulcer*, or *cancer* of the stomach; or it may be (as above) substitutive or vicarious of absent menstruation.

UTERINE hemorrhage (other than the natural monthly flow) may come from *congestion* of the womb, or its *ulceration*, or *cancer*. During pregnancy it threatens miscarriage, or results from misplacement of the *placenta* (after-birth).

Hemorrhage from the *bowels* may be connected with *piles* (hemorrhoids), *dysentery*, *ulceration* of the bowels, *cancer*, *rupture* of an *abdominal aneurism*, *typhoid*, *malarial*, or *yellow fever*, or *vicairous menstruation*.

HÆMATURIA (bloody urine) may follow a mechanical *injury*, *inflammation* of the *kidneys*, *stone* in the bladder, or a bad state of things in cases of *scarlet fever*.

Symptoms Connected with the Breathing Organs.

Sixteen to eighteen times in a minute is the ordinary rate of breathing while at rest, in health, for a grown person. In *fever* it is

almost always a good deal faster than this; often thirty, forty, or more respirations in a minute. When a person is *poisoned with opium*, the breathing becomes *snoring*, and very slow, even only six times or less in a minute in heavy narcotism. *Apoplexy*, and pressure upon the brain from a piece of a *broken skull*, are also attended by slow, snoring respiration.

DIFFICULTY OF BREATHING may be caused by irrespirable gases (as chlorine, etc.) in the air; obstruction in the air-tubes, as from croup, asthma, or bronchitis; disease of the lungs or pleura, as in pneumonia, consumption, or pleurisy; disease of the heart or aorta; abdominal dropsy, pressing upwards.

COUGHING, also, may have a variety of causes, of the nature of which we may often judge by its character. Thus it is, commonly, dry and tight, in early bronchitis; soft, deep, and loose, in advanced bronchitis; hacking, in the beginning of consumption; deep and distressing, in advanced consumption; short and sharp, in pneumonia; hoarse and barking, in an early stage of croup; whistling, in advanced membranous croup; paroxysmal (in spells) and whooping, in whooping-cough; dry and hollow, when sympathetic or nervous.

EXPECTORATION is *white*, *thin*, and *mucous*, in catarrh and early bronchitis; *yellow* and *thick* (*purulent*) in severe and protracted bronchitis; *rusty*, in the middle stage of *pneumonia; bloody*, *thick*, and *yellow*, in developing *consumption* (phthisis); in heavy, round, small yellowish, *lumps*, in *advanced* consumption; *putrid* (rotten), in *gangrene of the lung*.

The BREATH is *hot*, during fever; *cold*, in the collapse of cholera. The odor of the breath is seldom perfectly agreeable except in a healthy child. Bad teeth and imperfect digestion are common causes of unpleasantness in it. It is very heavy at the commencement of a *fever;* sour, during an attack of *indigestion;* rotten, in gangrene of the lung.

HICCOUGH is produced by a spasm of the *diaphragm*, at the floor of the chest. It may depend upon *indigestion*, *nervous disorder*, or great *exhaustion*. In the last of these, it is generally a decidedly bad symptom.

SNORING (stertorus), respiration results from *oppression of the brain;* the cause of which may be either *apoplexy*, *fracture of the skull*, *dead drunkenness*, or *narcotism by opium*. (Of course we do not forget that some persons snore tremendously during their natural and healthy sleep.)

Symptoms Affecting the Muscles.

POSITION is often significant in disease. Inability to rise may be owing to *general weakness*, *palsy*, *inflammation of the joints*, etc.) as from *rheumatism* or *gout*), or an injury, such as a broken thigh or leg.

INABILITY TO LIE DOWN is generally the result of *difficulty of breathing* (dyspnœa), which doctors then call *orthopnœa*, or *straight-up* breathing.

In COLIC, the patient usually prefers to lie upon the breast.

In PERITONITIS, the chosen position is on the back, with the knees drawn up.

In the *early stage* of PLEURISY, the patient lies of choice on the side not affected; after *water collects* (effusion) this is reversed. When the liver is *enlarged* from disease, the right side is mostly preferred. When the heart is much disturbed in its action, the sufferer generally cannot lie on the left side. Exceptions occur in heart disease, especially of long duration.

In ANEURISM OF THE AORTA, a favorite position is sitting up and leaning over the back of a chair, or the edge of a bed.

MUSCULAR WEAKNESS may result from acute disease, as fever, or from exhaustion. Entire want of exercise weakens the muscles. When an arm or a leg has been long fastened up in splints on account of a fracture, its muscles are almost powerless upon first being taken out of their confinement.

SPASM may be of either of three kinds; *fixed*, or *tonic* spasm, as in *lock-jaw* (tetanus); *regularly jerking*, or *clonic*, as in fits or *convulsions;* an *irregularly* jerking, as in St. Vitus' dance or *chorea*. *Cramp* is a short-timed *tonic* spasm.

TREMOR (trembling) is of two kinds; *constant* trembling, as in *shaking palsy* (*paralysis agitans*), and tremor only when doing something, as in one form of disease of the brain and spinal marrow:

RIGIDITY of muscles is different from mere spasmodic contraction. It occurs in

certain severe and continued cases of *palsy* (paralysis).

JERKING of the tendons, especially at the wrists, is met with in low states of continued *fever*, typhoid or typhus.

Symptoms Connected with our Senses.

PAIN is variously interpreted, according to its place and character. It may be

ACUTE, sharp, cutting, as in pleurisy; shooting, darting, as in neuralgia; piercing (lancinating), in cancer; gnawing, tearing, in rheumatism; dull, heavy, aching, as in pneumonia; griping, twisting, in dysentery; bearing down, in second stage of labor; pulsating, in the formation of an abscess; burning, smarting, in erysipelas; stinging, nettling, in urticaria (nettle-rash); constant, or intermittent; fixed or wandering.

TENDERNESS on pressure is generally a sign of *inflammation*, although some *neuralgic* cases have it; possibly from inflammation of the sheaths of the nerves. *Tired muscles* also are often sore to the touch as well as on motion.

Sometimes pain is relieved by pressure; this is often the case with *colic*. In such instances we conclude that there is no inflammation.

Pain is not always at the place of disease. In disease of the *hip-joint*, the principal pain is at the knee; in *dyspepsia*, often, over the middle of the breast; when the *liver* is disordered, under the right shoulder-blade; in irritation of the *womb* at the top of the head.

LOSS OF SENSATION (*anæsthesia*), occurring from disease, constitutes one kind of *paralysis*. The other form is loss of power to move the limbs or parts affected. When paralysis involves one side of the body only, as the right arm and leg, or the left arm and leg, we call it *hemiplegia*. *Paraplegia* is palsy of both legs at the same time.

The Eye in Disease.

BLOOD-SHOT eyes show either inflammation of them or fulness of blood in the head, which is often present in *fevers*. If one eye only is very red, of course the trouble must be in itself. *Yellowness* of the "whites" of the eyes occurs in bilious disorder.

The eyelids are notably *prominent* in that curious and rather uncommon disorder called "exophthalmic goitre." *Prominence* or bulging of one eye only shows a probability of disease, as a tumor, behind that eye.

SINKING of the eyeballs in their sockets is seen to some extent in consumption and other wasting diseases. Sinking of one eye must result from wasting of its own substance or of the socket behind it, the former being often observed in the blind.

ROLLING of the eyes from side to side is common in great nervous restlessness of infants or young children.

SQUINTING, which is natural with some, and an acquired habit with others, becomes a serious symptom when it occurs as the result of disease of the brain.

The lustre of the eyes grows dull often a short time, perhaps a few hours, before death. *Bright* eyes are commonly noticed in advancing consumption. They may *glare* in *mania* (insanity), or, for a time, in acute *inflammation of the brain*.

Very small pupils of the eyes are seen when either they are, or the brain is, the seat of inflammation. In *opium-poisoning* the pupils are contracted, at least until very near death. They are large (dilated), commonly, in *apoplexy*, *water on the brain* (hydrocephalus), and poisoning by *prussic acid* or by *Jamestown weed* (*stramonium*) or *belladonna*.

Great shrinking from light (*photophobia*) exists in severe inflammation of the eyes, and also in acute inflammation of the brain.

SPOTS, *rings*, etc., floating before the sight (*muscæ volitantes*) show the presence of opaque particles in the interior of the eyeball (*vitreous humor*), which are not of much importance. *Fixed* dark spots are of more consequence; they often show a beginning of blindness.

The Ears.

PAIN in one of the ears, earache, may be either *inflammatory* or *neuralgic*. Other signs must be considered along with it to show which it is.

RINGING in the ears occurs from either of at least two or three causes, to distinguish between which is not always easy. Large doses of quinine, and of one or two other powerful medicines, will make many people's

ear ring or roar. Disease of the ear will often produce this symptom, even when the disease is not severe at the time. In other instances, *brain exhaustion*, or *congestion* (overfulness of blood) of the brain, may give rise to it. If it be heard only in one ear, we may be confident that the cause is in that ear itself.

DEAFNESS, or hardness of hearing, in various degrees, may proceed from cold in the head, very large doses of quinine, typhus or typhoid fever, wax accumulated in the ears, disease or injury of the ears, brain disease.

Headache.

Pain in the head may depend in different cases upon neuralgia, rheumatism, overfulness of blood (*congestion hyperæmia);* blood-poisoning (as by alcohol, opium, etc.); fever (remittent, typhoid, etc.); disease of the brain, sympathetic irritation (as with uterine disorder, etc.).

Skill as well as care may often be necessary to make out, in an actual case, to which of these a headache belongs. *Neuralgic* headache is nearly always on one side only or chiefly, and extends to the face also; it is shooting or darting, and there is with it some *tenderness on pressure*. *Rheumatism* of the scalp is usually accompanied by stiffness of the muscles that move the head and neck. Headache from *fulness of blood* or *fever* is attended by heat of the head; the pain is then apt to be throbbing in character. Pain from *disease of the brain* is generally in one spot, either fixed or in spells (periodic or paroxysmal); and some other sign of brain disease is also present with it.

Expression of the Face.

ACUTE disease is apt to alter this more than that which is chronic; but it is often changed in both. An anxious or distressed expression giving way to serenity is always a good sign, unless it be the result of *mortification* or *palsy* coming on.

GREAT ANXIETY is seen especially in organic diseases of the *heart*, and in acute disorders of the *abdomen*, as well as in *melancholy*.

TERROR belongs habitually to *delirium tremens*, also called *mania-a-potu*, or the *horrors*.

RAGE is now and then seen in insanity, and in some, not all, cases of *hydrophobia*.

INSANE persons, although not always very peculiar in countenance, have mostly an expression by which their derangement can be recognized by those accustomed to observing it.

COLLAPSE, that is, extreme prostration, as from the shock of a railroad accident, an attack of cholera, or the dying state from any cause, has its own characteristic expression, more easily understood when seen than described. Shrunken cheeks, pale or livid, with mouth drawn down at the corners, and white, glassy eyes; these with clammy coldness to the touch, gasping respiration, and a thready or absent pulse at the wrist, mark this condition.

Delirium.

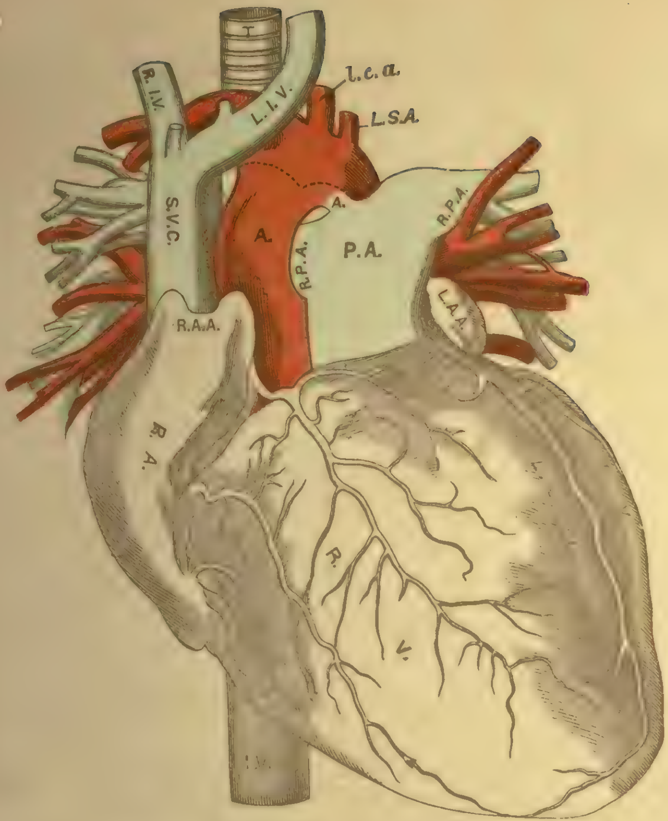
This is a disorder or confusion of mind, in acute disease, not fixed for a long time like insanity, but depending upon a temporary cause. It is present in many attacks of maladies attended by fever; as severe remittent, typhus, typhoid, scarlet, or yellow fever, etc. A few persons are liable to transient delirium during almost any brief attack of illness. *Mania-a-potu*, as already said, has a characteristic delirium, in which, almost always, there is extreme terror, from imaginary enemies or dangers of some kind. Grown people are affected by delirium usually under circumstances which, in a child, would bring on convulsions.

Stupor.

COMA is the medical word for this. It is an unnaturally deep sleep, from which one cannot be roused. We meet with it chiefly in the following: Alcoholic drunkenness ("dead drunk"); opium-poisoning (narcotism); apoplexy; very low typhus fever; compression of the brain from fractured skull.

It is not always easy to say, in a particular case, which of these is present.

Intoxication is generally shown by the odor of the breath, and the general appearance of the patient, and his behavior before he became unconscious. In *opium poisoning*, the pupils of the eyes are, as a rule, strongly contracted, even when no considerable



HEART AND HEART VESSELS.

T. Trachea (Windpipe).
R.I.V. R. Innominate Vein.
L.I.V. L. Innominate Vein.
l.c.a. Left Carotid Artery.
L.S.A. Left Subclavian Artery.
S.V.C. Superior Vena Cava.
I.V.C. Inferior Vena Cava.
A. Aorta.
a. Ductus Arteriosus.
R.P.A. R. br. Pulmonary Artery.
P.A. Pulmonary Artery.
R.R.A. R. Auricular Appendix
L.A.A. L. Auricular Appendix
R.A. Right Auricle.
L.V. Left Ventricle.
R.V. Right Ventricle.
L.C.A. Left Colonary Artery.

ARTERIES OF THE HEAD AND NECK

P.A. Post'r Art. of the Ear.
T.F. Trans Facial.
T. Temporal.
O. Occipital.
I.C. Int'r Carotid.
E.C. Ext'r Carotid.
F. Facial.
L. Lingual.
S.T. Sup'r Thyroid.
I.T. Inf'r Thyroid.
C.C. Common Carotid
A.C. Ascending Cervical.
S. Subclavian.
S.C. Superf. trans. Cervical.

light is shining on them. *Typhus fever* is known by the history of the case; as, in it, complete stupor is never the condition at the very beginning of the illness. A *broken skull*, if not obviously accounted for by a known injury, may be found out by careful examination of the head.

DIZZINESS (giddiness, vertigo) is accounted for in different instances by either of four causes: mere *weakness;* disorder of the *liver* (biliousness,) and *stomach;* disease of the *internal ear;* disease of the *brain*. The last of these is the least common, unless in persons over sixty years of age.

LOSS OF SPEECH (*aphasia*), or getting the wrong words instead of those intended, comes from a disorder of the brain. It is often accompanied by loss of power, especially in the right arm and leg. Loss of voice (*aphonia*) is another thing; resulting from thickening of the lining membrane of the windpipe (*larynx*), or paralysis of its muscles; or, in the dying or nearly dying state, extreme debility.

Symptoms Affecting the Secretions: The Bowels.

CONSTIPATION (tightness of the bowels; absence or rarity of movement, and smallness of amount discharged) is almost always present during the first days of a fever, of any kind except typhoid. Even in that, also, although early looseness of the bowels is more common, there is in a few cases a short time of constipation.

Pregnant women are very apt to have the bowels constipated, from the partial obstruction produced by the pressure of the enlarging uterus upon the lower bowel (*rectum*). Sea-sickness, also, is very often attended by slowness of the bowels. But the most obstinate and alarming constipation is that of *obstruction* of the bowels; as in *strangulated rupture*, or in *intussusception*.

DIARRHŒA (excessive liquid flow from the bowels) is symptomatic of various disordered conditions. It is present as a rule in *typhoid fever*, and is common in advanced pulmonary *consumption*. It is an essential part of the attack in *cholera-morbus*, *epidemic cholera*, and *cholera infantum* (summer complaint of infants). It occurs frequently by itself, particularly in warm climates, and in the summer season.

Discharges in diarrhœa are either *natural* (fecal), *mucous* (slimy), *bilious*, or *watery*. In *cholera-morbus*, which may be met with anywhere, the passages are nearly natural or bilious, unless near the end of a very bad case. *Epidemic cholera* is distinguishable partly by the *rice-water-like* abundant discharges, with no biliary color at all.

DYSENTERY is recognized by scanty but frequent *bloody* discharges, with *griping pains*, and a disposition to *bear down*. Slime (*mucus*) is apt to be mingled with blood, and at a later period in severe cases there may be pus.

Excretion of the Kidneys.

Symptoms connected with this excretion are: strangury (difficult urination), incontinence of urine (want of control, especially during sleep), retention, suppression, and excess of the secretion (*diabetes*), and unhealthy character of the urine passed.

STRANGURY sometimes follows the application of a fly (*cantharides*) blister. Now and then it is observed in children from the irritation of seat-worms in the lower bowel; and in young infants, owing to an irritating quality of the urine; which, in such a case, is pretty sure to be scanty and high colored.

NIGHTLY INCONTINENCE of urine is quite common in children, sometimes up to their "teens." Dribbling while awake shows a much greater loss of power over the bladder. This is seen in many cases of injury or serious disease of the *spinal marrow*.

RETENTION of urine may be a very distressing symptom. Men suffer it who have "stricture" of the *urethra* (outlet tube from the bladder). *Nervous disturbance* may cause it in either sex, but especially often in hysterical women. *After child-birth* it follows pressure upon the neck of the bladder. In *low fevers*, as typhus or typhoid, it results from general debility. Its probability should always be remembered in such cases, as the patient may be "out of his mind" and so may give no account of it. We should make sure, in a fever case (or, indeed, in any other illness), *how much* and *how often* water is passed. If the quantity is certainly small, it is necessary to examine the abdomen as

its lowest part, over the bladder. When urine is retained, there will be a firm swelling at the lowest part of the belly, just in front, above the bony ridge of the pelvis; and, on tapping there with a finger, a dull sound will be made. If the bladder be empty, the sound will be rather hollow.

In some cases of *spine disease*, there is retention instead of incontinence of urine. This symptom, however produced, often calls for relief by the use of a tube introduced through the urethra into the bladder, called a *catheter*. It is short and almost straight for the female; longer and curved (if of metal or firm rubber) for the male subject.

SUPPRESSION of urine is always a bad sign, in any case of disease. It is sometimes met with in low fevers, epidemic cholera, bad cases of scarlet fever, and long standing cases of disease of the kidneys. *Uræmia* (blood poisoning with materials of urine) follows it, and usually ends life in a few days at most.

EXCESS of urinary discharge is called by physicians *diabetes*. It occurs not unfrequently, for a time, after checking of perspiration by exposure to cold and with hysterical or other nervous persons.

Qualities of the Urine.

About forty, or from thirty to fifty, fluid ounces (a quart, more or less) of urine is passed by a healthy grown person every twenty-four hours. It may be retained longer in the female than in the male bladder, but not many hours commonly in either. More is passed, and more frequently, during winter than in summer.

The color of healthy urine is that of amber. It should be clear when passed, and should have very little settling at the bottom, even after standing for some hours. Yet some change in color, lighter or darker, or variations in quantity, and even deposit of sediment, may take place while the person continues in health. Such alterations often show the successful relief of the system, by excretion, of what, if not carried off, might have caused disease. *Great and continued* alterations in the urine, however, are important signs of something being wrong; and, under skilful examination, the nature of the disease may thus be found out. For this kind of inquiry the skill of the physician, trained in the use of chemical tests and the microscope, will be required.

GRAVEL is the term applied to small stony particles which are formed in the kidneys from disease, and pass, first along the *ureters* to the bladder, and thence out through the *urethra* with the flow of urine. *Pain*, sometimes very severe, may attend both of these short journeys of particles, if they be *large*. Often, they are more like *sand* than gravel, and escape without giving pain, except that both the kidneys and bladder are apt to be in a state of irritation at the time of an "attack of gravel."

STONE in the bladder is of the same nature, only the particles accumulate into one or more masses, which may become very large, and cause great suffering; not seldom, unless removed by an operation, shortening life.

GALL-STONES are formed by thickening of bile in the gall bladder, which lies under the liver, on the rightside, near the middle of the body. Although the gall-duct, through which such stones pass to the small intestine, is short, a large gall-stone (biliary calculus) sometimes gives extreme pain in its passage. Complete relief comes when it enters the small intestine (*duodenum*); as is the case likewise when a *gravel-stone* escapes from the ureter into the bladder.

Perspiration.

Besides *deficiency* and *excess* in this important secretion of the skin, it is a familiar fact that it has, in some persons, a very unpleasant odor, especially in the armpits and about the feet. Perhaps this is somewhat most manifest in the African and other tropical races, but much depends on individual constitution and cleanliness. A few persons, with all possible care of their skins, still have a considerable odor, at least in warm weather. For such it is important to bathe frequently, applying good soap and water daily to their armpits and feet; and also to keep their bowels regularly and sufficiently open.

In small-pox, typhus fever, and some other diseases, an odor peculiar to each is given off (in some cases at least) from the body.

REMEDIES AND THEIR APPLICATION

Do doctors, properly speaking, *cure* the diseases and injuries of their patients? Yes, and no. *Cure* comes from a Latin word meaning *care*; to *take care* of something or somebody. That a good physician will always do. Sometimes, also, he may and must actually *interfere* with what is going on; as when he gives an antidote for a poison, and so saves life that would otherwise be lost. But, in many other instances, he simply *takes care* of the patient, and Nature *cures*, in the full sense of that word. There is, as we are created, a tendency to get well. A bone, for example, is broken. What does the surgeon do? He draws it out straight, gets the pieces into their proper line, and puts on splints to keep them there. Then the bone knits, in a few weeks, of itself. So also with the healing of a wound. Its edges are placed and kept close together, if that can be done, till they unite again; or, if that be not possible, the wounded surface is covered with something which can do no harm, and which protects the part from outside air and other things, until it heals, of itself.

Here we see that certain conditions are wanted in each case, in order that the knitting or healing will take place. So it is with diseases, as well as with injuries. Some disorders are naturally self-limited; that is, they will, if the patient lives for a certain time, get well of themselves; they run a tolerably regular course, and then end. Scarlet fever either kills or is passing off, generally, within eight, nine, or ten days; small-pox runs its course, living or dying, within about three weeks; typhus fever, in four weeks; typhoid fever, in the same or a longer time; and so with other fevers, all of which are self-limited.

There will always be need of doctors, and of skilful, well-trained, and well-informed ones, too, however highly we may appreciate the powers of nature and the value of good nursing. It is important to be sure that by their timely and well-judged use even of simple measures, death may often be averted or long postponed; suffering may be much lessened, and recovery may be hastened from diseases which otherwise would be of very uncertain and far-off result.

Looking at remedies from our present standpoint, we may classify their *objects* as follows. Whatever their nature, they are used for one or more of the following purposes:

To relieve pain;
To compose nervous disturbance;
To promote sleep;
To open the bowels;
To check diarrhœa;
To ease vomiting or sickness of stomach;
To allay indigestion;
To improve weak digestion;
To reduce inflammation;
To lower fever;
To ease or quiet cough;
To stop hemorrhage;
To regulate menstruation;
To relieve dropsical swelling;
To support the system under prostration or exhaustion;
To increase strength in prolonged debility;
To cure certain diseases by special remedies;
To expel worms;
To antidote poisons;
To obviate the danger and suffering of accidents or injuries.

A full consideration of all the articles and procedures that are or may be used under advice of physicians for these different purposes, would make a work on "Materia Medica and Therapeutics." Our present aim will be to give a simple general view of the subject, and to dwell on such remedies as are safe and available in Home Medicine.

To Relieve Pain.

Much depends on *where* the pain is, and of *what sort*. ANNODYNES are medicines whose action is to quell pain, by their influence upon the brain or nerves. But we do not nearly always have to resort to these on account of pain, especially when it *first begins* to be felt.

To Relieve Pain.

Of all parts of the body, probably the abdomen is the most frequent seat of pain. "Stomach-ache" and "colic" are very common. The most general cause of such attacks is *indigestion*, with *flatulence* (wind in the stomach and bowels). To make the *muscular coat* of the stomach and intestines contract actively and evenly, all along their length, will, at least if done early, be pretty sure to give relief. For this purpose we give warm and gentle *stimulants* to the stomach, as essence of peppermint, essence of ginger, or some other aromatic (spicy) medicine.

But a frequent cause of irritative pain in the stomach or bowels is the presence of acid from indigestion. Against this we have what are called *antacids*, because they *neutralize* acids by combining with them. Such are *lime-water*, *soda*, and *magnesia*. Often there is great advantage, in cases of colicky pain, in adding one of these to an aromatic.

Further, the bowels are often *constipated* under the same circumstances, and this makes matters worse. It is of much importance then to *move the bowels*, by purgatives, or, as the milder ones are called, laxatives. *Magnesia* is one of these, being also, as above said, an antacid, thus having a double advantage. *Rhubarb* is another; it is combined with aromatics in *Spiced Syrup of Rhubarb*, an excellent preparation, especially for children, and as a *mixing liquid* or "vehicle" for other stronger and more unpleasant medicines. Another, often good in colic, though nasty, is *castor-oil*.

Remedy for Pain in Abdomen.

A safe and often very useful remedy for pain in the abdomen, or, indeed, anywhere else, is the outward application of a mustard-plaster. When doubtful what else to do, try that. Properly used, it can do no harm, and will most probably do good, often a great deal of good. A hot piece of flannel laid over the belly will sometimes be almost as useful as a mustard-plaster.

Colicky pain may be lessened by firm pressure on both hip bones, near their front edge. This can be done with one's own thumbs and fingers, or by those of another. The pressure should be pretty hard, though steady and not enough to hurt of itself.

Gentle pressure, and still better *kneading* the bowels, at the seat of pain from flatulence, will often help to scatter the wind and promote its moving and passing downwards, which is very important to colic.

Also, rubbing over the stomach and back with a hair-brush or clothes-brush, as briskly as can be comfortably borne, will sometimes do a wonderful amount of good for colicky pains.

If such palliative means as those just spoken of, as *aromatics*, *laxatives*, and *outward warming applications*, do not, in a reasonable time, show signs of affording relief of severe pain—we may have to obtain medical advice, or in its absence to resort to *anodynes*. Of these, the quickest and most effectual are those made from *opium*, especially *laudanum* (tincture of opium). A much weaker one is *paregoric* (camphorated tincture of opium). *Camphor* is, in the form of spirits of camphor, both an *aromatic* and an *anodyne;* in the latter quality, however, less potent, at least in ordinary doses, than opium. Both, and especially opium, require great *care* in their use. (Doses of all remedies and medicines recommended, will be found tabulated in a later part of this book).

Pain in the abdomen, however, by no means always comes from indigestion or colic. It may possibly be the beginning of *inflammation of the bowels*, or of *dysentery;* of *peritonitis;* or of *obstruction* of the bowels. It may be seated in the *liver;* in the *kidneys* (then rather in the *back*); if low down, in the *bladder;* in the female, in the *ovaries* or *womb;* or there may be an *aneurism of the aorta*, or a *cancer;* or it may be only a form of *neuralgia*. For each of these, which a good deal of knowledge may be needed to ascertain, a different kind of treatment will be called for; the pain being only one of the manifestations of disorder. Therefore any suspicion of so serious a possibility as either of these (or even *severe* or *obstinate colic*) will be a proper reason for promptly obtaining the advice of a physician.

For the relief of pain in the *side* or *chest*, a mustard-plaster is to be considered, after trial of rubbing, and simple heat (by a hot

flannel, hot flat-iron, bag of hot salt or sand, or a tin vessel filled with hot water) the first active remedy. So much here depends on the origin of the pain, that no further uniform treatment of chest or side pains can be advantageously laid down. Pain in the chest may result from *pleurisy*, *pneumonia*, *neuralgia*, *rheumatism*, *heart-diseaes*, *aneurism of the aorta*, etc., or from so secondary a cause as *dyspepsia* ("heartburn," cardialgia). Each of these requires some difference of management.

Other Seats of Pain.

Pain in the head is of several kinds, and dependent on several causes. Very seldom are *anodynes* suitable as remedies for headache, because they all act more or less powerfully on the brain, and so, may do harm. As a rule, we may say, *never* take opiates or other anodynes for *headache*, unless directly under medical advice. For "*sick headache*," which is habitual with certain persons, and then very hard to cure or even relieve, the most frequently useful remedy is a dose of *magnesia* or *aromatic spirit of ammonia*. When an aching head is hot, we are safe always in trying to cool it, by laying upon the forehead a light handkerchief wet every few minutes with cold water. A *neuralgic* headache will be more likely to be helped by application of heat to the part affected. Gentle rubbing with a pencil of *menthol*, such as is now sold by druggists, will often mitigate, if not relieve, it.

Pain in the face is likely to be ot one of three kinds: *toothache* in a decayed tooth (or more than one); *inflammation* of the jaw; or *neuralgia*. For the first, the most certain remedy is, to apply to the hollow of the aching tooth the end of a bodkin or darning-needle, around which is wrapped a little bit of cotton dipped in pure *creosote*. As this will burn the lips or gums if it touches them, care should be taken to have it overflow as littie as possible; and a glass of cold water must be at hand to rinse the drop or two away, if such does escape into the mouth. If the creosote reaches the right spot, it will quell the pain at once. *Oil of cloves*, used in the same way, is nearly as effectual; and rather less so is laudanum.

For *inflammation of the jaw*, advice had better be taken at once from a dentist or a physician. A hot poultice of flaxseed-meal, into which has been poured a teaspoonful of laudanum, may be safely applied to the painful side of the face, and covered with oiled silk (or oiled paper, or thin sheet-rubber) to prevent it from drying up and getting cold too soon.

Earache is most common in young children. A simple first remedy for it is a drop of *warm sweet oil* poured from a bottle or a teaspoon into the ear. If that fail to relieve, a drop, (or in a child two or three years old, two drops) of *laudanum* may follow it.

Pain in the joints is usually called *rheumatic;* although this word is not always definitely used. When there is no swelling, or heat (signs of inflammation), *warm applications* are likely to do good. For the pain of the joints in *inflammatory rheumatism*, the most relieving thing is *laudanum;* laying on the joint a bit of rag, doubled and wet with laudanum, and binding over it a piece of oiled silk. It will not do to put laudanum in this way over too many parts at once; as some of it is absorbed, a large amount of it might *narcotize* the patient.

Neuralgic pain in any part of the body is generally but one symptom of a general condition, depending on a predisposition of the *nervous system* and (in most, not all cases) *poverty of the blood*.

The former, being constitutional, is to be attended to by all the ways we have of favoring the general improvement of health and strength. Poverty of blood is treated also by good nourishing food and *iron*. For the immediate relief of attacks of neuralgia, many things are helpful, while nothing is certain in every case; except that, if driven to it by great suffering or exhaustion from pain, anodynes (as opium, or morphia, or some of their preparations) will stupefy sufficiently to "drown" the agony.

Temporary weakness often brings on attacks of neuralgic pain in those disposed to have them. Such persons should never wait too long for a meal. Likewise, hot food, as a cup of hot milk, or cocoa, or beef-tea, at the very beginning of the attack, may stop its progress.

Heat applied to the painful part will frequently do good; any convenient mode of application will answer. On some parts of the body a *mustard-plaster* is just the thing. *Sunshine* will (as I have seen) cure some attacks. On the other hand, I have read of ice applications having the same effect; but I have never witnessed its trial. The Japanese remedy, *menthol*, or *oil of peppermint*, is conveniently applicable in the form of rounded sticks, made by the druggists by mixing it with spermaceti. One of these may be gently rubbed over the painful part for a few moments at a time.

Various powerful anodynes are sometimes advised by physicians to be put upon, or *hypodermically injected* near the seat of severe and obstinate neuralgic pain. As in the case of *rheumatic joints* a rag soaked in *laudanum*, laid on the part and covered with oiled silk (or oiled paper) will often stupefy the nerves of the part so as to quell the pain. Anodyne *liniments* are often used with advantage. I may mention one which is moderate in strength and safe (applied outside only): mix *one drachm* of *chloral hydrate* with *four fluidounces* of *soap liniment*. This is to be gently rubbed in, for a few minutes at a time, over the part affected with pain.

Pain at time of menstruation (*dysmenorrhœa*) is habitual with some women, and occasional with others. For its prevention, those liable to it should keep quiet for a couple of days before the expected time, and then for another day or two. When the pain has commenced, the proper position is lying down. Warmth, not excessive, but enough for entire comfort, is also needful. Hot drinks, such as *ginger tea*, or hot water with a little *essence of ginger* in it, or a teaspoonful of *compound spirits of lavender*, will be suitable. So will *spirits of camphor*, or *camphor water*, and, in bad cases, *paregoric*, or even (carefully) *laudanum*. Clothes wrung out of hot water may be applied to the lower part of the abdomen. Very severe suffering of this kind may, in rare cases, call for injection of laudanum into the bowels.

Piles (small lumps at or near the *anus*, *i.e.* outlet from the lower bowel) are sometimes very painful, especially at or after the time of movement of the bowels. Constipation should be avoided, as far as possible, by those who are troubled with piles, and yet purging actively will not agree with them. *Rhubarb* is the best laxative in such cases; or sulphur, *not* magnesia.

Inflamed piles may be soothed, if much heated, by application of very cold water. Yet, contradictory as it seems, warm, or moderately hot water, will give still more comfort in some cases. A flaxseed poultice into which a teaspoonful of *laudanum* has been poured will be suitable when the patient is in bed with a bad attack. An ointment, as cold cream (of the apothecary), should be frequently applied. It is well to know that an attack of pain and soreness in piles (which are often present without giving much trouble) may be many times prevented by the early and free anointing of the parts with cold cream, tallow, or lard.

Strangury (pain in passing water) is to be treated by the warm bath, or hip-bath (sitting-bath), followed by an application over the bladder, or between the thighs, of cloths wrung out of hot water. Also, taking *camphor water* and *flaxseed tea* containing a little sweet spirits of nitre, as a drink. Severe cases may justify an injection of laudanum into the bowels, or the placing in the lower bowel of a *suppository* of opium.

Under the name of anodynes (pain relievers) several other drugs are named in medical books. We need only *mention* here hydrate of chloral, belladonna, cocaine, hyoscyamus, stramonium, cannabis indica, and chloroform. Every one knows, also, what a boon to those who have to undergo surgical or dental operations is the *breathing* (inhalation) of anæsthetics, as ether, nitrous oxide, and chloroform. These are called by that name because they *annul sensation*, for the time. For extracting teeth, pure nitrous oxide is the best; for larger operations, ether is much safer, though less convenient, than chloroform. The use of ether, in this way, requires much skill, judgment, and care.

Composing Nervous Disturbance.

What this requires depends very greatly on the cause and nature of the trouble. For infants, as well as older persons, nervous

disturbance may vary all the way from slight fidgeting to fits or *convulsions*. Mild medicines for moderate degrees of, for example, "hysterical" nervousness, are *assafœtida*, *camphor*, *valerian*, and *Hoffman's Anodyne*. Physicians often prescribe also, *bromide of potassium* (or of sodium), *musk*, and others.

CONVULSIONS are very much more common in children than in grown people; and most so of all at teething time. They are least dangerous during infancy, but are always alarming. What is to be done between times to prevent or ward them off, is an important and often difficult question for even the physician to answer.

When a child "has a fit," lay it upon a bed, loosening all its clothing, especially about its neck. Have good fresh air in the room, but also sufficient warmth. Make two mustard-plasters, one for the stomach and one for the back. Get a warm (almost hot) bath ready. If the plasters are prepared first, put them on; if the bath first, let them wait, and place the child in the warm water at once. In the last case, also pour gently cold water over the head while the child is held laid in the bath.

The mustard-plasters (whether first or second in time) are only to stay on long enough to *redden*, *not blister*, the skin. This should be ascertained by looking under the plaster every few minutes. A very little while will be enough to redden and burn a child's skin if the plaster is strong of mustard. But it will be better for it to have, for an infant, only one-third part of mustard, the rest flour or Indian meal.

After the bath, have prepared a mixture of soap and hot water, and into a teacupful of this put a dessertspoonful of milk of assafœtida (if at hand) and a teaspoonful of castor or olive oil. Let this be thrown into the bowels with an injecting syringe; a towel being then held for a little while against the fundament to prevent the injection from escaping at the moment.

Adult men and women rarely (although they do sometimes) have convulsions, except those which are either hysterical, puerperal, or epileptic. The principles of management of *hysterical* and *epileptic* convulsions, during the attack, are essentially the same as for that of infantile convulsions. Treatment *between* attacks is a more difficult affair—to be conducted by those who are skilled in medicine. *Puerperal* convulsions (that is, occurring during labor, or after child-birth) are more peculiar, and ought always to have immediate attendance from a physician. Few cases of illness are more serious and critical than these; not only in appearance, but in reality.

Promotion of Sleep.

When sleeplessness comes as one of the symptoms of a disease, it may not have to be dealt with by itself, at least with medicine, unless it be more prolonged and distressing than usual. In every case quietness is indispensable, through the evening and night. Little or no light should, during the night, reach the eyes of the patient: if accustomed to darkness, this will be best.

If difficulty of sleeping (*insomnia*) result from nervous disturbance, exhaustion, overstudy or anxiety, *management* should always be perseveringly tried before resorting to drugs so powerful as the sleep-producers (*hypnotics*, *narcotics*.)

Very light, easily digested food should, under such circumstances, make the last meal of the day. Yet a person not strong will sometimes be kept awake by having an empty stomach late at night. A cracker, a drink of sugared water, or a small wine-glassful of beef-tea, may then make a better night. No excitement of the brain, as by reading or continued conversation, should be allowed for two hours before usual sleeping time. Being read aloud to, if the book be not too interesting, answers in some cases; but an objection to it is that it requires the presence of more light than is desirable.

Mothers and nurses often sing their babies to sleep. That is a very good expedient, and may now and then succeed even with a grown person.

Exercise, in moderation, and in proportion to one's strength, may be very well taken in the evening to promote sleep. A walk in the open air will do, or a few minutes' flourishing of not too heavy dumb-bells. Getting a little tired makes one

sleep; while real *exhaustion* has the contrary effect.

Some people imagine that if they cannot get asleep at once, they might as well be up and doing something, reading or writing, or walking about. This is a very great mistake. If not sound asleep, or even far enough towards that to entirely lose consciousness, we may yet get a good deal of rest in partial sleep; and the more of this we get the better, in the saving and renewal of strength. Keep still, then, in the dark, with closed eyes, and try to dismiss active thought. Count 100, 200, 300; repeat doggerel verses, as wrong as you can misremember them; watch imaginary sheep jumping over fancied stiles, one, two, three, four, and on, to twenty-five or fifty. Fight your eyelids; after a while, the brain-vibrations, like those of a bell that has been struck, will lull by degrees, and sleep may come at last.

Hardly without a doctor's advice, if that can be procured, ought any one to take strong sleep-compelling doses, such as *hydrate of chloral*, *laudanum*, or *solution of morphia*. *Lactucarium*, which is obtained from the garden lettuce, used for salad, is much milder than opium; and camphor water will, when mere nervous restlessness is the matter, often compose so as to allow of sleep. *Hoffmann's Anodyne* is similar in its effect, and *tincture of hops*, or a tea made of hops, is very quieting. Even a *hop-pillow*, made by sprinkling hop-leaves with alcohol and binding them in a pillow-case, will sometimes bring the tossing head to rest.

Purgative Medicines.

A large number of drugs act upon the bowels; cathartics is a technical name for these. Only a few of them need to be considered in connection with our present plan.

Rhubarb is adapted to a greater variety of cases than any other medicine for the simple purpose of relieving constipation. *Simple syrup of rhubarb* is very good for this use with babies. Younger yet, however (under a year), *sweet oil* (olive oil) is mildest of all, unless it be *manna* or *glycerine*. *Fluid extract of senna*, with one drop of *oil of aniseed* or *oil of fennel* in a teaspoonful of it, is also a good infantile laxative. *Castor oil* comes next, when a more active purge is wanted; or, when there is sourness of stomach, *magnesia*.

At any age, *magnesia* is the best antacid laxative. *Castor oil* is to be preferred when *colic* or *irritation of the bowels* is present. [Give it in twice as much *spiced syrup of rhubarb*, well mixed up.]

SALINE purgatives are useful generally at an early time of attacks of sickness with fever. Take *citrate of magnesium* or *Tarrant's Aperient*. *Seidlitz* powders are of similar cooling effect; and the same is true of *Rochelle salt* and *cream of tartar*. *Pullna* and *Hunyadi mineral waters* please the taste of some.

At the beginning of acute attacks of disease with fever, the use of some purgative medicine, especially of the saline kind, *is very serviceable and important*. This is true, as a rule, of *measles*, *scarlet fever*, *whooping-cough*, *small-pox*, and *varioloid*; and, with more discrimination of cases and moderation in doses, also of *diphtheria* and *typhus fever*. *Typhoid* fever has *diarrhœa* as an early symptom generally. If, in it, the bowels are exceptionally costive, only a *teaspoonful* of *castor oil* had better be ventured upon to relieve the bowels. In measles the bowels sometimes incline to be too free; but this should not prevent our making sure of their *full* movement during the first two or three days. When, after that, they become too loose, a weakening excess of purging may be checked by suitable means, such as will be presently mentioned.

For *habitual costiveness*, either chewing at bedtime a small piece of Turkey *rhubarb root* (as big as a pea), or taking at that time a *rhubarb pill*, will be the best thing to begin with. If that fails, take another piece, or another pill, also before breakfast.

Compound rhubarb pills are stronger; they will, with most people, *purge* rather actively. *Compound cathartic pills*, of the United States list, are too strong to use except when a *very decided purgation* is needed.

Often, when the mildest and least disturbing way of emptying the lower bowel is required, an enema (injection into the bowels) will be the best. For this, a simple and generally satisfactory mixture will be made by dissolving a thumb-sized piece of

Castile soap in warm (almost hot) water, and stirring into this a tablespoonful of molasses, a tablespoonful of table salt, and a tablespoonful of olive or lard oil, or a dessertspoonful of castor oil. There are different kinds of injecting arrangements. With the most convenient, a person can (unless ill) wait upon himself. If too sick for this, or if only the old-fashioned straight syringe can be had, its point should be greased with lard, and then, the patient lying (best on one side) on a bed, it can be *very gently* introduced into the opening to the bowel to the distance of an inch or so, and gradually the liquid may be forced through the syringe.

SUPPOSITORIES are sometimes yet more convenient, and are least disturbing of all; but they are not so sure to take effect, and their action does not extend far upward. A suppository is a small soft mass, preprared for the purpose; rounded, about as large as the last joint of a woman's little finger. Common *brown soap*, cut into such a size and shape, and dipped in castor oil, or lard, may be so used. All that is to be done is to push it well into the anus (outlet of the bowel), and let it stay there.

After either a suppository or an enema has been introduced, the patient ought to try to retain it for some minutes, for effective operation.

To Check Diarrhœa.

Not every looseness of the bowels ought to be stopped at once by medicine. Sometimes it is a *relief* to a condition of the system which would involve a worse illness if it did not come.

Infants, especially, need to have the bowels moved two or three times daily; most of all while they are *teething*. We do not call it diarrhœa in them unless there are at least four or five *large liquid* passages in twenty-four hours. Of course when it is excessive it must be attended to, or weakness and exhaustion will follow.

CORRECTIVES, generally, should be the first things given in babies' diarrhœa. Sourness of stomach is commonly present with it; therefore *lime-water* being antacid, is particularly suitable. Another good corrective is *spiced syrup of rhubarb*. On account of the spices in it, this article does not purge like simple syrup of rhubarb; it only promotes an even, regular action of the muscular coat of the bowels, and so tends to get things right again.

Soda (*sodium bicarbonate*) is an antacid corrective, stronger in this effect than lime-water; but less astringent or binding.

Cinnamon water is a gentle astringent; so is *camphor water*. These do well to come next after lime-water or soda and spiced rhubarb, if the complaint is not corrected by them. Should it still be obstinate, more potent checking medicines will be needful. Of these, *paregoric* and *laudanum* have much power; but they must be used very cautiously, on account of their containing opium.

Of the many *astringent* medicines employed by physicians, under whose advice, when it can be had, they had better be taken, we may mention here, as possibly wanted in home practice, *chalk mixture* and *tincture of catechu*. A desperate and exhausting diarrhœa, which resists all such treatment as has now been spoken of, may call for the use of a *laudanum and starch enema*. This is introduced with a *small* syringe, even for a grown person; the object being to have it *stay* in the bowel; just the opposite of what we want from a *purgative* injection. A syringe holding an ounce will do for this purpose for an adult; half an ounce for a child. Two or three drops of laudanum, with starch, made not too thick to run, will be the infantile dose for such an enema (even less for a babe under a year old); thirty or forty drops of laudanum, with less than an ounce of starch, for a grown person,

DYSENTERY differs from diarrhœa, in having many small and bloody passages, with *straining* or *bearing down*, as well as pain. (Sometimes there is abdominal pain with or before each passage in diarrhœa.)

Sick Stomach.

As this occurs under a variety of circumstances, the main treatment of every case must depend upon its nature and cause. We may name, however, several remedies which will do good in most cases of nausea or vomiting, and which, therefore, it will be safe to use while awaiting medical advice.

ICE is one of these. It may be taken into the mouth in small pieces, and melted before swallowing. This is helpful in nine out of ten instances of sick stomach, and in the tenth case will do no harm.

LIME-WATER is beneficial in most of such cases; when nourishment is needed. it may be given in equal parts with milk, from a teaspoonful to a tablespoonful of each.

EFFERVESCING WATERS (mineral-water, soda-water, Apollinaris, etc.), made cool with ice, very often assist in relieving nausea. When sea-sick, iced mineral-water will be likely to help more than anything else.

When *weakness* is present, teaspoonful doses of brandy or (the best) whiskey may be appropriate. The smallness of the dose is here especially important, and it need not often be repeated more than three or four times, at intervals of half an hour or so, unless great exhaustion is impending. Very seldom ought anything alcoholic to be ventured upon as a remedy without the express advice of a medical authority. *Children's* doses, of such and of all strong medicines should be very small *Ten drops* of brandy or whiskey will be enough at a time (if needed at all) for a child of two or three years, where a teaspoonful would be given to a grown or nearly grown person.

AROMATIC SPIRIT OF AMMONIA is reviving to one who is faint with sickness of stomach. It is antacid as well as stimulant.

SODA (bicarbonate of sodium) is antacid, but not stimulant. It is generally very comfortable to a disturbed stomach.

WARMING stomachic doses for nausea are *ginger*, *cloves*, *cinnamon*, and other aromatics (spicy articles) in small doses. Large draughts of ginger, hoarhound, chamomile, or boneset tea, or even of clove or cinnamon infusion, will bring on vomiting. This is an instructive example of the opposite effects, often produced by the same thing, in small and in large doses.

Sometimes, with constipation, or even, especially in summer, with commencing diarrhœa, small doses of magnesia are composing to the stomach. The same is true of very small doses of calomel ($\frac{1}{12}$ to $\frac{1}{4}$ of a grain), which, however, belongs to the physician's rather than to the home list of medicines. Still, out in the country, where advice cannot always be had in time, a family medicine-chest may very well have in it, among other things only for *posssible* or *occasional* use, a small box or package of $\frac{1}{12}$-*grain calomel-powders*. They may be serviceable particularly at an early stage of *summer complaint* in children.

PAREGORIC is the only other medicine needing here to be mentioned among those likely to assist in quieting a nauseated stomach.

OUTSIDE, an early remedy for vomiting may, in any case, safely be, a mustard-plaster over the pit of the stomach. For a young child, a spice-plaster will, for this purpose, be preferable; made by mixing together one or two teaspoonfuls each of several spices—as ginger, cloves, and cinnamon, or half as much red pepper, with a similar amount of wheat or Indian flour; wetting these with whiskey, and spreading them on a piece of muslin or thin flannel. This, when laid over the stomach, should be covered with a piece of oiled silk or oiled paper or rubber-cloth, to retain its moisture for a longer time.

Indigestion.

A much overloaded stomach is best relieved by being made to throw out its contents under the action of an emetic. This is, however, a harsh remedy, not nowadays often resorted to.

Ordinary indigestion requires, for one thing, to give the stomach rest. Let no food be taken for a number of hours; if the patient is strong enough, not for a whole day. Make sure that the bowels are open; to carry off the refuse of undigested or half-digested food.

If the stomach is still unsettled, the aids to nature which we may resort to are those just above-mentioned, as suitable for cases of nausea and vomiting. Small and few doses, however, are likely to be necessary for common attacks of indigestion. If, with these, there are *dizziness*, *headache*, a *yellow tongue or eyes*, and a bitter taste in the morning on awaking—a set of symptoms designated usually as *biliousness*—small doses of the old-fashioned blue pill may be reasonably and safely given.

Practically speaking, of blue pill, a small dose for indigestion, with signs of participation by the liver, will be *one grain* at night, and again the next morning; and perhaps again the second night. Compound gentian pills may be taken for two or three days, if entire relief does not come sooner. This is the prescription:

Take of blue mass, five grains; powder of rhubarb root, and extract of gentian, each twenty grains; oil of cloves, four drops. Mix these together, and divide the whole into twenty pills. One or two should be taken at once.

When there is lingering indigestion, after an attack, with some flatulence, the bowels not being sufficiently free, yet not requiring a strong purge, two of the above pills may be taken, twice daily, for two or three days; not longer at one time, on account of their containing a small amount of mercury.

Continued Weak Digestion.

The class of medicines which particularly *tone up* a weak and relaxed stomach are the simple vegetable bitters. Such are *quassia*, *columbo*, *gentian*, and some others. *Simple* bitters we call these, because they have no other very positive quality except the bitter taste, and no marked effect upon the human system except as tonics to the stomach. (In *large* draughts their infusions or "teas" will act as *emetics*.)

There are some bitters which have other very important actions. Quinia is one, got from Peruvian bark; it acts powerfully on the nervous system, and is the special remedy for malarial fevers. The same bark contains also cinchonia, and several other more or less bitter tonic and *nervine* "alkaloids," as the chemists name them.

Nux Vomica is a very powerful bitter nervine tonic. Out of it is obtained strychnia, one of the deadliest of poisons, but also one of the most valuable of medicines, when used with judgment, care, and skill. With this information, we may venture to add that the *tincture of nux vomica*, in ten-drop doses, twice or thrice daily, is one of the most effective of all the stomachic bitters, in cases of continued weakness of digestion, with flatulence.

These bitters generally improve the appetite, which is almost always poor when the stomach is otherwise weak. For the same end, as appetizers, mineral acids are useful; dilute *aromatic sulphuric* acid, for example, under the common name of *elixir of vitriol*, and *chlorohydric* acid, formerly, and sometimes now, called *hydrocholoric*, or muriatic acid. *Nitromuriatic* acid adds a special tendency to act upon the liver. One or other of these acids, and most of all the last named, is often given to the subjects of prolonged indigestion, along with the vegetable bitters.

To Reduce Inflammation.

A serious task, this is, in many instances; taxing the doctor's skill, and not very rarely baffling him. How, then, can one say anything about it in a work on Home Medicine? A few clear principles seem to be all that can be here spoken of, referring the reader for a larger discussion of the subject to treatises designed for the medical profession.

Inflammation (as already said in that part of this book which dealt with the nature of diseases) may affect any organ or portion of the living body. When it attacks one of the more *important* organs, or even extensively involves the skin, life may be endangered by it. If only a small part, as an eye, ear, hand, or foot, is inflamed, there is usually much less danger, though there may be a great deal of suffering. Moreover, an inflammation may *spread*, as from the ear or the eye to the brain; or some poisonous (septic) matter may be formed in the inflamed part, and by *blood-poisoning* (*septicæmia*), the whole body may suffer and perhaps die. Septicæmia is very often fatal, but a vast multitude of people have inflamed hands, feet, eyes, noses, jaws, etc., without either it or the allied disorder, pyæmia. The liability to such accidents of inflammation is greatest where the atmosphere of the place is foul.

Taking a broad general view of inflammations as a class of disorders, it may be said that they have *three stages*, or progressive changes.

First comes excitement. Towards the centre of the inflamed part, the arterial

blood-vessels beat and throb; being roused to endeavor, so to speak, to overcome the obstruction there. Heat, redness, swelling, and pain, all belong to this stage.

Then follows exudation. This is the forcing of some of the fluid portion of the blood (often with some of the *white corpuscles;* occasionally also a number of the *red corpuscles*) out, under the pressure of the excitement and resistance together, through the walls of the vessels, into the substance of the part. If this fluid is thin, it may collect as a "serous effusion;" such as is frequently the result of pleurisy. When thick and adhesive, it glues parts together (*plastic lymph*); this happens in the pleura, in the peritoneum, in the pericardium, and in the membranes of the brain. If, again, there are many white corpuscles in it, and the vitality of the part is disturbed much, *pus* is formed; we have suppuration; with either an *abscess*, or, at once, a yellowish or greenish prudent discharge (as in severe *bronchitis*).

This is one way in which the three stages of inflammation may follow one another. But, differently from this, there may be the first stage of excitement, and the second, of exudation (effusion), with, for a third, instead of suppuration, gangrene, or *mortification*.

More frequently we have inflammatory excitement, and moderate or small exudation, followed by resolution; that is, the inflammatory process ceases, without either suppuration or gangrene; and the part and the patient get well.

Now, what can be done by *treatment* against the going on of inflammation to its worst (gangrene), or the next worst (suppuration), or the third in seriousness (liquid effusion)?

We can attack it in the first stage of excitement, with, in many cases, very good effect. This is what we mean by *reducing* inflammation; moderating the violence of the conflict between the surrounding throbbing blood-vessels and the obstructed centre, so that the least possible damage shall be done by it.

Means Used in Reducing Inflammatoin.

For this purpose, the means available in different cases are, chiefly, these:

Rest; Position; Cold; Diet; Purgation; Blood-letting; Cooling Medicines; Nervous Sedatives; Counter-irritation.

REST of the part is indispensable in all inflammations. When the part is small, and is not used in moving about, the body need not be absolutely confined. If it be otherwise, as when an ankle is inflamed from a severe sprain, and still more when a lung, or the pleura, or a bowel, is so affected, the rest must be complete, in bed. Carrying a sore hand in a sling rests it; covering an inflamed eye with adhesive plaster closing the lids, or remaining in a darkened room, gives it repose. But any one with an inflamed lung must be kept as still as possible; and must not even speak, unless in a whisper. If the brain be inflamed, quietness and almost darkness will be necessary, to avoid mental as well as bodily disturbance.

POSITION can be made to help when a hand or a foot is inflamed. By keeping the part raised, the tendency of blood towards it will be lessened advantageously.

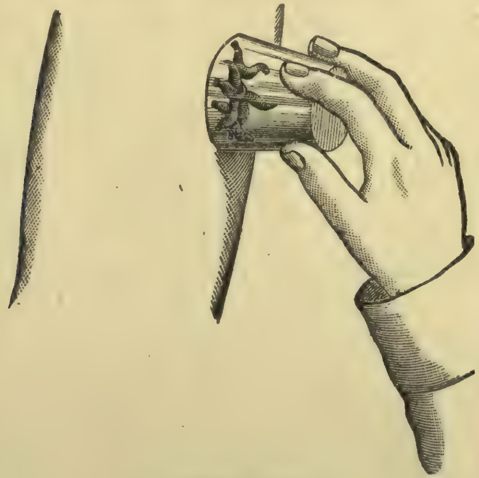
COLD is often a powerful *antiphlogistic*, as old writers called whatever tends to reduce inflammation. It must, however, be steadily applied, to have this effect. *Dashing* cold water on a part and then leaving it, in a place not itself freezing cold, will from reaction, make it warmer than before. When the brain is inflamed, a good plan is to shave the head, or at least cut the hair very short, and keep it half covered with light rags soaked in ice-water. For steadiness of effect, the rags must be dipped in the cold water every few minutes. A more effectual method—more convenient, however, for the abdomen than for the head—is to lay over the inflamed part a coil of light rubber tubing, through which cold water is made to pass. This is done by placing one end of the tube in a vessel of water somewhat higher than the body, and allowing the water to pass out at the other end, which is placed lower.

DIET was formerly much relied upon, and low diet was made very low—almost to starvation. We know now, that inflammation is possible in feeble as well as in strong bodies. Not every one can bear doing long without food, or even with too

little food. Also, strength is necessary to shake off disease, so to speak. It is not strength, but excitement, that we want to reduce. A really low, thin diet, therefore, is only suitable for a strong person, and in no case for many days together, during illness. It is important, however, when *fever* is present, with which the power of *digestion* is always weak, to give food in a simple, liquid form, so as to cause the stomach no trouble in appropriating it.

PURGING MEDICINES act like an unstimulating diet, in cooling the blood, and thus promoting a quieter action of the heart and arteries. This favors the reduction of the excitement which attends a violent inflammation of any part. The cathartics which have the most effect of this kind are the *Salines*, as Epsom salts, Rochelle salt, citrate of magnesium, cream of tartar, etc.

TAKING BLOOD, either from a vein in the arm (venesection) or by leeches or cups,



LEECHES APPLIED.

from an inflamed part (local blood-letting), is a very ancient remedy. Once overmuch used, the reaction in our time has gone quite too far against it. It is a very valuable means of reducing inflammation.

Cooling or Sedative Medicines.

COOLING (sedative) medicines are in place chiefly in inflammatory affections of the breathing organs, as pneumonia, bronchitis, and pleurisy. *Tartar emetic* is the most powerful of these. Once it was very largely used. Its harsh action upon the stomach and bowels has caused it to be now given mostly in very small doses; from the one-sixteenth to the one-fourth of a grain only, for adults, at an early stage of a violent inflammation attended by fever. Tartar emetic is not suitable to be used as a domestic medicine.

Ipecacuanha resembles it in its disposition to bring on vomiting, but is very much milder and safer. Ipecacuanha is a very proper article for family use, under many circumstances.

Nitrate of Potassium is a sedative, cooling medicine, not now very largely used by physicians. *Digitalis* was once considered a sedative; now it is called a *tonic* to the heart. *Ergot* has great popularity in the medical profession at the present time, in the treatment of subacute inflammatory troubles, particularly of the spinal marrow. None of these last—nitrate of potassium, digitalis, or ergot—can be advantageously used without medical advice.

The nerve-centres have much influence over the movements of the blood, and some nervous sedatives are important in their secondary effects upon inflammation.

Aconite is one of these. It is a strong poison in any but very small doses, and must be used only with the greatest care. *Tincture* of *aconite* is the common preparation. Its dose is from half a drop to one or two drops, in water, every one, two, or three hours. Some physicians of experience give it in almost all cases of inflammation of the lungs, pleura, etc., even in children. If it is kept in the family medicine-chest, it should be distinctly marked poison.

Opium has obtained a very large place in the treatment of one dangerous inflammation, that of the peritoneum (*peritonitis*), which lines the whole interior of the abdomen. Opium tends to constipate the bowels, and powerfully affects the brain. It also tends to diminish secretion in the air-passages, and therefore it does not appear to be suitable, at least at an early stage, in inflammation of the bowels, brain, or lungs, or in *acute bronchitis*. After the *excitement* has subsided, in *dysentery* and in *bronchitis*, perhaps sometimes in *pneumonia*, it may aid in

allaying pain and checking excessive discharges.

COUNTER-IRRITATION is a term which explains itself. Endeavor is made to draw blood and nervous excitement from an inflamed part by a harmless irritation or inflammation somewhere else. *Blisters* are strong means of this kind. A blister is raised by leaving on the skin for a time a plaster made of ointment of cantharides; or painting the part with cantharidal collodion, and covering it, while moist, with a piece of oiled silk. With a child, an hour or two will generally be enough to allow the cantharides (Spanish fly) to act. In a grown person, it may require three, four, or more hours. There should always be a piece of gauze between the skin and the blistering plaster, so that it can be entirely removed at the proper time. When it is taken off, the scarf-skin (cuticle) being raised in watery swellings, these may be pricked with a point of any kind, to let the water out. Then there should be placed over the sore surface a piece of muslin or lint thickly spread with simple cerate, to heal it up in two or three days.

The time for blistering (which is only called for in rather bad attacks of internal inflammation) is not at the beginning of the case, but after the excitement of the circulation has ceased. The disorders, in the course of which, at such a stage, a blister is most likely to do good, are *inflammation of the brain*, *pneumonia*, *pleurisy* and *membranous croup*.

Other modes of counter-irritation are, painting the skin with *tincture of iodine*; rubbing over a small surface a drop or two of *croton oil*; or a little *tartar emetic ointment*.

Painting with iodine is a milder measure than blistering with cantharides; and it may be resorted to in a greater number of cases, of moderate violence. Croton oil and tartar emetic ointment are only employed in *obstinate chronic* cases of irritation of internal organs. They produce very sore, pimply, or pustular eruptions.*

* If either of these should be used, great care must be taken not to get the oil or ointment into any one's eyes. A patient of mine nearly blinded himself by neglecting this precaution; putting his fingers to his eyes just after rubbing croton oil upon a part of the skin.

Fever.

Reminding the reader of what was said, a few pages back, of the nature and signs of fever, it may be said now, that what we want to do when those signs (*heat*, *excitement* of the *circulation*, *locking up of secretions*, and *weakness*) are present, is, first, and chiefly, to ascertain and remove, if possible, the cause of the attack. We should also try to lessen the heat, promote the return of the secretions, and support the system through its period of weakness.

To diminish heat, cold water is the great remedy. Almost incredible it seems, that physicians were once afraid to give cold drinks to patients suffering with raging fever. A man with small-pox, two hundred years ago, was shut up in a close room, with red curtains hanging about his bed, blankets piled on him to promote perspiration, and, for the same end, only hot and bitter drinks, herb teas, were allowed him! All the world knows better now, and follows nature's pointing better than that. *Thirst* is an almost universal symptom of fever; and frequent draughts of cold water are its best remedy. Ice-water is not the best, at least if the draughts craved and taken are large; it may be, to the most advantage, of about the temperature of deep well-water; about 50° to 52° Fahr.; although nearer the freezing-point will answer well. If the stomach is very irritable, as is often the case in autumnal remittent and in yellow fever, small lumps of ice melted in the mouth and then swallowed, at short intervals, will do better than drinking much water at a time.

Cold water outside is a remedy naturally thought of; and it may be used, but carefully. *Sudden chilling* is not safe. Some physicians, especially in Germany, now treat cases of typhoid fever by immersing the patient for ten minutes at a time in a really cold bath. This seems to me not a plan to be approved. But the sponging of the face, arms, hands, and, part after part, the whole body, with cold or cool water, two or three times a day, is an admirable means of relief in fevers generally. Its service is perhaps most marked in scarlet fever, when the surface of the body is often intensely hot; the whole skin seems to be

inflamed. Bear in mind the great principle: we want to temper, to moderate the excessive heat; not to chill the body below its normal degree.

Certain additions to water as a drink will contribute to its refrigerant action. *Acids* have this tendency. *Lemonade* and the juice of *oranges* are generally suitable. *Citrate of potassium* and *acetate of ammonium* are the medicines most sure to be safe and beneficial for the same purpose; the former when the bowels are natural or constipated, the latter when there is a disposition towards diarrhœa.

Of the secretions, those of the bowels, skin, and kidneys require attention in fever, In most cases of *typhoid* fever and some cases of *measles*, the bowels incline to looseness from the start. When, in those diseases, they are not moved at all during the first day of the fever, a small dose of a mild purgative may be given; in typhoid fever, a teaspoonful of castor oil; in measles, a teaspoonful of citrate of magnesium (solid), or a half-wineglassful of effervescing solution of citrate of magnesium; or a teaspoonful of Rochelle salt.

These are exceptional febrile diseases. In *remittent* (autumnal, bilious, malarial) fever, a good brisk purging early in the attack with a saline medicine, such as citrate of magnesium (an even tablespoonful, solid, or a wineglassful of the solution, repeated in six hours if it does not operate) or Rochelle salt (a tablespoonful), will be pretty sure to be useful. *Typhus* fever requires caution, in expectation of great weakness; half of the above doses will be best for its treatment. *Scarlet* fever should be, as a rule, the occasion for a good cooling saline dose on the day the attack breaks out.

Purgatives help to clear out from the bowels and from the blood impurities which, while they remain, are poisonous to the system. But real *purgation* belongs in fevers, as a part of the treatment, only to the early stage. After that, we need merely to see that the bowels are not constipated; a daily moderate movement will suffice. Some persons suppose that because a sick person takes only small quantities of food, he does not need to have his bowels open at all. But the waste of the substance of the body is going on even faster than during health, and the discharge from the bowels comes from this waste as well as from the refuse or excess of food.

Fever: Dryness of Skin.

Dryness of the skin is a regular symptom of fever. The most frequent exception to it is in the febrile state of *inflammatory rheumatism;* in which the skin, while hot, is sometimes quite moist. Generally, the dryer the skin, the worse; the coming of moisture shows the subsidence of the fever. The high heat and dryness are connected together. Reduce the temperature, and perspiration will break out. Therefore, the cold drinks and (careful) cold washing and sponging, spoken of as appropriate to lower the excessive temperature, will serve also to restore the secretion from the skin. Citrate of potassium, acetate of ammonium, and some other medicines favor this effect.

Diuretics are agents which tend to increase the action of the kidneys, the flow of urine. They are among the more uncertain remedies; they do not always act as we wish them to. In this they differ very much from purgative medicines.

The *salines* already mentioned (citrate of potassium and acetate of ammonium) are useful as *diuretics*. So are cream of tartar and sweet spirit of nitre. The latter is very often given in fever, when the amount of urine is small. Do not forget that sometimes, in low fevers, the bladder is full, but the patient cannot empty it. This must be examined into. If there is *retention* of urine, it must be drawn off with a *catheter*.

Fever: Diet and Treatment.

Weakness, in fever, is not quite the same thing early in the attack as towards its end. In the first place it is an oppression of the system; after a while there is more or less exhaustion. The first is best relieved by the means above referred to. At that stage, with persons of average strength, the amount of food taken may be small and its character light. (Persons always feeble will need to have concentrated food from the beginning.) As the attack goes on, even towards the end of the first week usually, and in scarlet fever and small-pox

sooner, the system loses strength, and support is necessary. What shall the means of that support be?

Liquid, strong food in small quantities and often is the rule. Milk (with lime-water in it if the stomach be very weak) and beef tea are the things to stand by. Strong mutton broth and chicken soup (with all fat fully skimmed off) will do for variation.

Supporting treatment for great debility has always, with physicians, included the use of something alcoholic, wine and whiskey being mostly preferred. Opinion in the medical profession on this subject has tended of late years (in the minds at least, of its safest leaders) towards a lessening of the amount of alcoholic stimulation in fevers, and towards resorting to it in fewer cases. Once it was almost a universal practice to give whiskey in all cases of typhoid, as well as of typhus, fever. Now, many cases of typhoid fever are found to get through well without it.

On such an important matter, in every actual case, the judgment of a physician should be obtained. The safest rule in home management of the sick will be (unless in extraordinary emergencies) not to give or take alcohol in any form unless advised by a competent physician.

Cough.

How many different kinds and cases of cough there are, we have already mentioned when considering it among the symptoms of disease. It cannot be treated exactly alike under all these different circumstances. As a symptom it is unpleasant, and often wearisome; and it is well to know of some domestic remedies which are safe and useful in many cases.

First, a dry cough must be softened and loosened. The three best home remedies for this purpose are ipecacuanha, squills, and wild cherry bark. Of the syrup of ipecacuanha, for this effect (not to cause vomiting) the dose is from a quarter to a half teaspoonful. Of syrup of squills, which does best at a later stage than ipecac, half a teaspoonful to a teaspoonful. Of syrup of wild cherry bark, a teaspoonful. This last may be given along with syrup of ipecac at first, and with syrup of squills afterward.

There is also real usefulness in the soothing effect upon cough of licorice, and of pure and well-made *candies;* hoarhound candy for example. The advantage of these is that a little of either can be taken very often, so as to keep up a nearly constant influence of the kind desired. Although such things only touch the swallowing part of the throat (*pharynx*), not the wind-pipe (*larynx*), yet the nearness and sympathy of these two surfaces cause the extension of the effect from one to the other. Spencer's *chloramine* pastilles are useful in this way.

After loosening, a wearisome cough may need to be quieted. This must be done with care, since to stop secretion and dry up a cough will make things worse. Opium and its preparations, including of course morphia, have the most power of this kind. They are often added to cough-mixtures, to be used after free expectoration of phlegm has come on. Wistar's cough lozenges, when made after the regular formula, are composed chiefly of licorice, with a little opium added. Syrup of lactucarium, also, is quieting to cough, and is a milder narcotic than opium. It may be used sooner and with less apprehension of excessive effect. Compound tincture of benzoin often has a very good effect, in fifteen to twenty drop doses, each dose taken on a lump of sugar.

Hemorrhage.

What causes bleeding must always be the first question. If it is a symptom of a disease, the necessity of treating the disease rather than the bleeding is plain. In such a case, only a large and weakening hemorrhage calls for special measures on its account. This is true of the bleeding at the nose in the first week of typhoid fever, *spitting of blood* in consumption of the lungs, *vomiting* of blood in ulcer of the stomach, and bleeding from hemorrhoids or *piles*. It is well to state clearly that there are no remedies which are always certain to stop bleeding from any internal cavity of the body.

Nose-bleeding.—Often this is rather relieving than otherwise, in full-blooded young people, who without it would have had headache. The occasion for stopping it comes when it is so large in amount, or continues so long as to weaken by loss of blood.

How shall we stop it? Tell the patient to avoid blowing his nose. *Clotting* (coagulation) is the natural way of stoppage of all hemorrhages. Bathe the forehead and outside of the nose and cheeks with cold water, or apply *ice* to the forehead (not too long at once, but enough to cause the impression of decided cold); or, if this does not suffice, to the back of the neck.

Put a plug of cotton well into the nostril from which the blood comes. If first dipped lightly in a strong solution of alum, it will be more effectual. Let the person keep quiet, with the head and shoulders raised. Holding both hands high above the head is said to help to stop bleeding at the nose.

Only one in a very large number of cases will be really dangerous. When all the above measures fail, a physician will be needed, who will effectually plug the bleeding nostril. For this a watch-spring arrangement is sometimes used, or an elastic catheter. If the latter, a string (waxed ligature) is put through the hole at the end of the instrument, and that is oiled and very gently passed back into the nostril until it can be felt at the opening above the throat. With forceps (nippers) one end of the string is then seized and brought out of the mouth. A piece of cotton is tied upon it, and then the catheter and the other end of the string are drawn out of the nose, and the cotton plug is held firmly against the back of the nostril. If still necessary, another plug may be again inserted in the front of the nostril.

Bleeding in the Mouth.

When a tooth has been pulled, or in an infant, the gums have been freely lanced, sometimes considerable bleeding will occur. If from a tooth, a plug of cotton may be dipped in *creosote*, or *tincture of chloride of iron*, and pressed into the bleeding cavity with the end of a bodkin or darning-needle. *Ice* may be applied to too freely bleeding gums, or they may have put against them a soft rag with *alum-water* or a *solution* of *tincture of chloride of iron*.

Spitting of Blood.

Is it from the *lungs*, or from the *throat, mouth, or nostrils?*

Not unfrequently, bleeding from the nose goes backwards, into the throat, and the blood, then hawked up, is naturally imagined to come from the lungs, sometimes causing great alarm. Inquiry and examination will make it clear whether this, or bleeding from the mouth, is the case.

Ulcerated throats sometimes bleed. The ulcer can then be seen, in a good light, if the tongue is pressed down with the handle of a tablespoon. This sort of bleeding, however, is not at all common.

When *vomiting* occurs before blood appears, we ascribe it to the stomach. The blood is then, usually, rather dark and thick; not fresh-looking.

If real *bleeaing from the lungs* takes place, the blood is coughed up (perhaps quite softly and lightly); it is, as a rule, bright red. Only a little may come; sometimes merely streaking the expectoration; or it may be copious; mouthfuls all at once. In this last case, it is attended by danger of exhaustion from the loss of blood.

No unprofessional person should think of taking charge of a serious hemorrhage without the aid of a physician, if one can be had. While waiting for one, however, what ought to be done?

Put the patient upon a bed, with the head and shoulders comfortably raised with pillows. He must keep very still and not speak. Let a piece of ice be taken into his mouth every few minutes, and swallowed slowly. Then fasten around each arm, above the elbow, a shawl-strap, if such be at hand, or a long handkerchief, quite tightly; leaving each on, however, only a few minutes at a time. If the bleeding does not stop, let them be tightened again and again, several times. Should this not succeed, and the doctor has not yet arrived, similar straps or bandages may be applied in the same manner to the lower limbs, just below the knees.

If blood comes from the *stomach*, it may be from *ulceration*, or *cancer;* or it may be *hysterical* (that is, connected with general nervous disorder), or, in exceptional cases, may take the place of menstruation which is suppressed. (*Bursting* of an *aneruism of the aorta* is a possible source of hemorrhage, either from the stomach or from the lungs:

but the existence of such an aneurism will mostly have been before discovered by an attending physician).

To moderate or check large bleeding from the stomach, as shown by free vomiting of blood, ice is the safest and most hopeful of remedies. Keeping quiet, and taking the least possible food in the liquid state, are important. Boiled milk with lime-water will be the most suitable nourishment; or arrow-root, tapioca, etc. In the absence of medical advice, no medicine had better be ventured upon; unless it be swallowing very small amounts of solution of alum, or, once in two or three hours, a single drop of creosote, dissolved in two tablespoonfuls of water.

Intestinal Bleeding.

For hemorrhage from the *bowels*, the same kind of management is applicable as that appropriate when blood is thrown up from the stomach; as just described.

Bleeding piles (hemorrhoids) are, of course, troublesome, but the bleeding, as such, does not nearly always require treatment. If it continues very freely, the patient must lie still in bed, with a piece of oil-cloth or rubber-cloth under the lower sheet. A piece of sponge or a napkin dipped in ice-water may be held against the fundament. If anything else is to be done, it ought to be upon a physician's advice.

Monthly Irregularities.

For delayed monthly courses it is desirable to produce a determination of blood towards the lower part of the abdomen. Hot foot-baths, and warm hip- or sitting-baths, are the most effective means for this end. Opening the bowels rather briskly with a Lady Webster's or a compound rhubarb pill, or Warner's cordial, or tincture of aloes and myrrh, will also be helpful towards it. Especial care must be taken that the body, and most of all the feet, shall not be chilled at such a time.

Permanganate of potassium is a good promoter of regularity in menstruation. Two grains may be the dose, twice daily, If it seems to agree with the patient, it may be continued through a month or two, discontinuing at the time of the monthly return, when that takes place.

For painful menstruation (*dysmenorrhœa*), lying still is very important from the beginning of the attack. Warm flannels may be applied to the abdomen. A hot drink is likely to be comfortable, such as this: Put into half a teacupful of hot water, a teaspoonful of Warner's cordial, a teaspoonful of compound spirit of lavender, and twenty drops of spirits of camphor; stir them well together just before taking it. Should relief not come in an hour or so, paregoric—a teaspoonful at once—may be given. Few cases will need any stronger anodyne; and they should be under the care of a physician.

Menorrhagia is excessive menstrual flow; a variety of *hemorrhage*. The most important part of its management is usually during the intervals, to prevent it. Near the expected time the sufferer, who has reason to fear it, should lie still in bed. When the excessive flow comes, cold wet cloths may be laid upon the abdomen, the rest of the body being kept comfortably warm. Only a decidedly bad case will fail to be thus moderated.

Dropsy.

For our purpose, in this place, it may be said that there are three classes of dropsical troubles: general dropsy (*anasarca*), superficial local dropsy (*œdema*), and local internal dropsies. After scarlet fever, the kind most likely to come is *anasarca*, general dropsy. From great weakness and thinness of the blood there often comes *œdema*, or local watery swelling, of the *feet*. Heart-disease, liver-disease, or kidney-disease will often bring on general dropsy; but, not infrequently, liver-disease will be attended by abdominal dropsy almost alone. Chest dropsy is another local internal form: and *water in the head* another.

For the cure of any of these, the great thing is to find the cause, and remedy it, if possible. Dropsy is often, though of course not always, one of the last results of disease, which itself may have continued for weeks, months, or years. The best hope of its being cured is in those cases in which there is not much else the matter, and when it has not lasted long.

For dropsy as a symptom, when it is right to treat that, physicians give *diuretics* and *purgatives*. Of the first may be named cream of tartar, juniper berries, and squills. Cream of tartar (bitartrate of potassium) acts also moderately on the bowels. Another purgative used in this way is jalap, frequently given with cream of tartar. More active is what is called the drastic cathartic, *elaterium;* which, even in very small dose, will purge severely. All these medicines, indeed the whole treatment of dropsy, ought to come under the judgment of a skilful physician. Such an one, when unsuccessful (as may happen) in reducing dropsy by diuretics and purgatives, may conclude it best to tap the patient; that is, to let out the water by introducing a small tube into the swollen part. This gives immense relief, sometimes permanent. In a certain number of instances the fluid accumulates again, and the operation may have to be repeated. Tapping the *abdomen* has long been an approved practice; doing the same for effusion in the *chest*, after *pleurisy*, has latterly been found suitable in a considerable number of instances; and even water around the *heart* (pericardial effusion) has been so relieved in some cases within a few years.

Another relieving operation sometimes performed for great watery swelling of the legs and feet is to lance the skin in a good many places, so as to make the water ooze out gradually. When this is done, the parts should afterwards be greased with cold cream or tallow, to prevent inflammation, which might become erysipelatous and troublesome.

Prostration: Debility.

We have seen already that there is more than one kind of weakness from disease. There may be *oppression*, as in the early stage of almost any acute disorder; or *depression* (prostration) from a great shock, such as a railroad accident, crushing a limb, or from the lowering influence of typhus or typhoid fever; or *exhaustion*, such as will be produced by a large hemorrhage, an attack of cholera morbus, or a severe disease of some length of continuance.

For *oppression*, in a person of good constitution and strength, unloading the system is needed—by sweating, purging, and action of the kidneys.

For *depression*, support is called for. Experience indicates that alcoholic stimulation is, in sudden or great prostration from any cause, the most effectual. It may enable the system to tide over the time of weakness and danger, so that all will go on well again; whereas, without it, the patient may sink and die.

Alcoholic stimulation is very often abused. It is employed when there is no occasion for it, and when required it is frequently too great in amount. Every little feeling of weakness does not properly call for a glass of wine or whiskey; far from it. Fainting is better treated by fresh air, as much as possible; dashing or sprinkling with cold water on the face, and ammonia. *Smelling salts* (carbonate of ammonium) put, for a moment at a time, under the nostrils, will hasten recovery from a faint. When swallowing is possible, twenty or thirty drops of the *aromatic spirit of ammonia* may be taken in a wineglassful of water.

But when a person is almost dead from loss of blood, or an extensive burn, or the shock of a railroad accident, with white lips, shrunken cheeks, cold skin, and rapid, thready pulse, we need to stimulate with alcohol, but not too much. A *teaspoonful* of whiskey will be enough, in many instances, repeated in ten or fifteen minutes, if the patient does not show reaction. A *tablespoonful* will be a large enough dose at one draught in any case. More will do no better towards stimulation, and the after effect will be worse. Always, moreover, such stimulation must be withheld as soon as the depression has passed away, and then the less alcohol he has had put into his system the better.

General Debility.

After an acute disease with fever—as scarlet fever, measles, typhoid fever, etc.—*convalescence* is accompanied by more or less debility. But when everything goes well, appetite is then strong, and the losses of the system are made up by the appropriation of food. A person who was healthy before such an attack will commonly need no help from medicines to "build up" again.

Running down in strength, however, with or without acute disease, and often without any fixed disorder of any great organ, is not uncommon, from various causes. Too severe, monotonous, and long-continued labor, out of proportion to one's strength; worry, particularly when it prevents refreshing sleep; living in a close air, without change and exercise; these are some of the conditions in which people are apt to get down "below par" in strength.

Poverty of blood (*anæmia*) is generally present in such cases. So is *loss of appetite* and digestive power; and *nervous depression*. These are the three elements of ordinary continued debility.

Treatment for Debility.

To meet these, we have, besides rest from care, change of air, and generous feeding (all of which are of the greatest importance), three sorts of tonics: *blood-renewers*, *appetizers*, and *nervines*. Of the first class, referring to works on Materia Medica for others, the most valuable, in the generality of cases, are iron and cod-liver oil. To the second class belong the *vegetable bitters*, as *gentian*, *quassia*, *columbo*, *chamomile*, etc.; and the *mineral acids*, as *aromatic sulphuric acid* (elixir of vitroil), and others. Under the third head may be named quinine as most largely and safely applicable to general debility. Physicians also use, in some selected cases, *strychnia* and *phosphorus*, as powerful nervine tonics; but they are too dangerous to allow in the family medicine chest for use without medical advice. One preparation, if labelled *poison*, and kept out of the way of the children and of ignorant servants, may sometimes find safe use as a tonic both to the digestive organs and to the nervous system; *tincture of nux vomica;* safe in the small dose of ten drops twice or thrice daily.

Remedies for Special Diseases.

We have very few real and certian *specifics* for the cure of particular diseases. The great boast of the medical profession is of its power to stop "chills and fever" and control other kinds of malarial attacks with quinine, and with some other preparations from the same source, namely, the Peruvian Bark. *Syphilis* is, undoubtedly, curable in the large majority of cases, timely attended to, by the skilful use of two remedies, mercury (various preparations) and iodide of

TUBERCULOUS LUNG.

potassium. *Itch* is always conquerable by a sufficient application of sulphur, in ointment or otherwise.

SCURVY is curable, without much aid from medicines (tonics if any) by *fresh vegetable food;* as potatoes, onions, oranges, lemons, etc. *Inflammatory rheumatism* is beneficially influenced by salicylic acid and alkalies (potassa, soda, lithia); as gout has been long known to be by colchicum.

Besides antidotes for actual *poisons*, and medicines which kill or drive out *worms* from the bowels, we cannot claim any other clear examples of special remedies for particular diseases. It used to be said that *iodine* is a certain cure for *goitre* (enlargement of the thyroid gland in the neck). It is no doubt generally serviceable in that affection; but it will not always cure it. Quinine does not always cure ague. It "breaks" the chills, but in one, two, or three weeks they may come again; and the cure then has to be finished by a month or two of a course of *iron*.

There has not yet been discovered any specific remedy for scarlet fever, measles, whooping-cough, small-pox, typhoid or typhus fever, yellow fever, or cholera. All these diseases must be, therefore, conducted through the attack as safely as possible; meeting the symptoms as they occur, with the most reasonable measures we know of.

PRINCIPAL MEDICINES AND OTHER REMEDIES

For the reader's convenience, we will now give a brief account of the principal medicine in general use likely to be particularly mentioned in the following pages. As they are ahlphabetically arranged, there will be no difficulty in finding any one of them for reference.

Acetate of Ammonium Solution.—This is a mild, moderately cooling medicine, very suitable to promote perspiration during fever. It is easily made by dropping small pieces of *Carbonate of Ammonium* into good *Vinegar*, piece after piece, until it ceases to bubble with effervescence. (This proceeds from the Carbonic Acid gas passing off, being displaced by the Acetic Acid of the Vinegar.

Dose of this Solution, a Tablespoonful every two or three hours. It is preferred to other sweating medicines especially in *typhoid* and *typhus* fevers; *low* fevers, so-called. It does not act upon the bowels.

Aconite.—Tincture of the Root of the Monkshood or Aconite plant. A deadly sedative poison in any but very small doses. It acts mainly on the nervous system, but indirectly on the circulation. Some physicians use it in many cases of *inflammatory fever*, as in that of pneumonia, pleurisy, etc. *Dose*, one or two drops, in water, for a grown person, every two, three, or four hours. A bottle containing it should be labelled Poison.

Aloes.—A powerful purgative medicine, having a particular tendency to act on the *lower* bowel. Therefore it is not a suitable cathartic in cases of *Piles*. Yet, in a very small, not purgative, dose, it is sometimes added to other medicines for the relief of piles. Its action on the lower bowel makes it more appropriate when *delay* of the feminine *monthly flow* is treated by laxative medicines. The *Tincture of Aloes and Myrrh* (Elixir Proprietatis) has been much employed for this end. *Dose* of *Aloes*, from one or two to ten or more grains. *Dose* of *Tincture of Aloes and Myrrh*, from one to three or four teaspoonfuls, in water.

Alum.—A mineral called a *salt* by chemists. It contains either *Ammonium* or *Potassium* with *Aluminium* and *Sulpuric acid* in combination. (There is also an *Iron* Alum, in which, likewise, Ammonium is present.) It is crystalline, and has a peculiar taste, easily recognized after making its acquaintance. Alum is not often given as a medicine for the stomach, except as an emetic in *bad* cases of *croup*. For that purpose, its *dose*, in powder, is half a teaspoonful, with the same amount of the powder, or a teaspoonful of Syrup of Ipecacuanha. In small dose, it is an astringent; that is, it tends to make the tissues which it touches shrink or contract together. Thus it helps to lessen the swelling of the mucous membrane, which is inflamed in *sore throat*, and it is much used for that, either in *powder* or in solution as a gargle. The powder may be *blown* into the throat through a quill, or, sometimes, *put* on the sore place with the end of one's finger. A *gargle* is made by dissolving a piece as large as a thumb in half a tumblerful of water. It is used by taking a mouthful of it and throwing the head back *without swallowing it*, letting it go as far down into the throat as it can without being swallowed.

Alum should not be employed in *mouth*-washes, because, when left long in contact with the teeth, the Sulphuric Acid in it acts somewhat upon their enamel. A solution of alum in pure water makes a good astringent eye-water, for inflammation of the eyes an even teaspoonful of alum in a tumblerful of water will be strong enough.

Ammonia.—*Volatile Alkali* and *Hartshorn* are other names for this substance. When pure, it is a gas; but it is used either in the form of the Solid Carbonate of Ammonium, or in solution in Water (*Aqua Ammoniæ*), or in Alcohol. Smelling salts consist usually of the Carbonate. Druggists keep a stronger and a weaker watery solution of Ammonia. The medicinal form most used is the *Aromatic Spirit of Ammonia* (a solution in Alcohol, with Spices). This is a stimulant and antacid preparation. Its *dose* is from ten to twenty-five or thirty drops, in water. *Aqua Ammoniæ* (Water of Ammonia) is used to make *Volatile Liniment*, by mixing it with an equal quantity of Olive or Lard Oil. This liniment is a

very warming thing to rub into the skin of the throat for a sore throat, as a counter-irritant.

Arnica.—The *tincture* of the flowers (or of the whole plant) is a popular application for bruises and sprains. It is a warming application, and not suitable where the skin is broken. Being poisonous when swallowed in large doses, it should be kept so labelled, and so used as to prevent mistakes with it.

Arsenic.—A metal whose compounds are poisonous. The medical form in which arsenic is generally prescribed by physicians is the solution of arsenite of potassium (Fowler's solution). *Dose*, from three to ten drops, twice daily: often given for chronic diseases of the skin. It should never be taken by an unprofessional person, without medical advice.

Assafœtida.—A gum-resin, of very disagreeable odor and taste; a good, mild, and safe composing medicine for disturbed nerves and to induce sleep. Assafœtida pills, of three grains each, may be given now and then to hysterical people. The drug is also good for *flatulence*. *Milk* of assafœtida is a very serviceable medicine for *babies' colic*. *Dose*, a teaspoonful, sweetened.

Bark, Peruvian. See quinine.

Baths.—In treatment of disease, the kinds of baths most used are the warm and the hot bath. We may call it warm from 90° to 96° Fahr., and hot from 96° to 100°. It never need be hotter than this last figure.

Warm baths are very often useful, for relaxing and tranquillizing the system. In *croup*, *convulsions*, and *lockjaw*, as examples, such effects are often well obtained.

Hot Baths though less frequently called for, are sometimes very serviceable; especially in cold and low states of the system. Chronic rheumatism is one of the affections likely to be benefited by it.

Hot Dry Air Baths (Russian bath) are occasionally advised by physicians, in obstinate prolonged skin affections, etc.

Vapor or Steam Baths are occasionally used for the application of heat and moisture to the body. They are not safe beyond the temperature of 110°, or possibly, for a short time, 120°. Moisture conveys heat to the body much more rapidly than dry air at the same temperature. A steam bath may be given, by the patient being stripped of clothing, and seated in a chair, wrapped, chair and all, in a blanket; his head only projecting above the latter. Then vapor may be generated by dropping very hot bricks into a pail of water placed between his feet. As above said, care must be taken about the temperature; and, on the whole, it will be hardly best to resort to a vapor bath without the advice of a physician.

Medicated Baths:—Hot and warm springs, as those of Virginia, are medicated by the sulphurous and other contents of the waters. Sometimes they do much good (bathing in the waters) for chronic troubles of the liver, kidneys, etc., and rheumatic joints.

Belladonna.—This product of the *deadly nightshade* (*atropa belladonna*) is a powerful narcotic or brain stimulant drug. The *extract* of the leaves is most used by physicians as a medicine, in neuralgia, etc. *Atropia*, a very strong alkaloid principle, is obtained from the root. Its solution is often dropped into the eyes by oculists, for the examination and treatment of affections of the eyes. It enlarges or dilates the pupils, giving them a more brilliant appearance. Ladies are said to take it sometimes before going into company, to make their eyes "brighter;" whence the name, from *bella donna*, *fair lady*.

Dose of the solid extract, a quarter of a grain to a grain; of the tincture, ten to fifteen drops. *Solution of atropia* for the eyes, two to four grains to a fluidounce of water. Neither should be used without medical advice.

Benzoin.—A resinous substance, from the *styrax*, an East Indian tree. The compound tincture of Benzoin is a good medicine for bronchial cough. Dose, fifteen to twenty drops, on a lump of sugar, every three or four hours; or at the beginning of a spell of coughing. The same tincture, applied with a camel's-hair pencil, is very healing to a *sore nipple* or a *cracked lip*, or even a *fissure of the anus*.

Bismuth Subnitrate.—A soothing stomachic medicine. Dose, two to five grains.

Blackberry Root.—Country people generally know the astringent property of this;

but some make a mistake in supposing the *berries* to have the same; which they do not. A tea made by cutting up a handful of the root and soaking it for two or three hours in boiling water (kept hot) will answer a good purpose in checking diarrhœa, in tablespoonful doses.

Blisters.—We use *mustard-plasters* not to blister, but only strongly to warm and stimulate the skin. For raising a blister, *cantharides* is mostly resorted to. The oldest way is to spread the *ointment of cantharides* on a piece of buckskin, three or four or five inches square; cover this with a piece of gauze, and lay it on the part. This will draw a blister upon a grown person in four, five, or six hours; with a child, in two hours or less. Then nip (do not remove) the raised scarfskin with the point of a pair of scissors, and lay upon it a soft muslin rag thickly spread with simple cerate, as a healing dressing.

CANTHARIS VITTATA.

CANTHARIS VESICATORIA.

Once in a while *strangury* (difficulty in passing water) will follow the application of a blister, from some of the cantharides being absorbed into the blood, and so getting through the kidneys into the bladder. Flannel wrung out of hot water applied to the *bladder* and *perineum* (crotch, just between the thighs at the pelvis); spirits of camphor, taken in twenty-drop doses; and, if the difficulty lingers, a laudanum injection into the bowels, are remedies for strangury.

Blue Pill, or blue mass. This is a preparation of mercury, one-third of the strength of calomel. It is a soft solid, easily made into pills. Apothecaries usually keep on hand three-grain blue pills.

The best established usefulness of blue mass is in the relief of what is called "biliousness," when there is a bitter taste in the mouth, especially on awaking in the morning; with some degree of nausea (sick feeling at the stomach), and more or less yellowness of the tongue and of the whites of the eyes; perhaps of the face or the skin generally; the bowels also being constipated, or the stools slate-colored instead of brown or yellowish-brown, as is natural. One or two grains of blue pill at bedtime, and the same again in the morning or the next evening, taking in all from two to four grains, will do well, without any risk of salivation, at least in all but one case or so in a thousand.

Calomel is better for a similar purpose as a baby's medicine. Indigestion and commencing diarrhœa in infants are often much helped by small doses of calomel; powders, each of which contains one-twelfth of a grain of the medicine, with a grain or two of soda (sodium bicarbonate) or magnesia, or only sugar; the last for taste, and to give substance to the small dose of the drug.

Borax.—A very familiar article this is, in the nursery, for *sore mouth*. It is a mineral astringent, milder than alum, and may be used more freely; either dissolved in water as a wash, or in powder with sugar, put with the finger right on the sore spot in the mouth.

Bromides: Potassium, Sodium and **Lithium.** These "bromides" are nervous sedatives; tranquillizing an excited brain in a different way from opium; having less sleep-compelling power than it. Bromide of potassium is largely prescribed by physicians for epilepsy and some less serious but obstinate troubles of the nervous system. Bromide of sodium has the same sort of effect, but perhaps is more agreeable to the stomach; and the same is true of bromide of lithium. Bromide of ammonium is less often used for similar effects. *Bromo-caffeine* often helps nervous headaches.

Dose, of either, five to fifteen or twenty grains, in water. The largest doses are best borne when taken at bedtime. Long use of large doses of either of the bromides sometimes causes an eruption on the skin, and some other unpleasant symptoms, called *bromism*, by physicians. For any one who suffers greatly from the sting of a bee, or other insect, twenty-grain doses of bromide of potassium may be advised.

Cajuput Oil.—An aromatic greenish (or, when old, reddish) oil, from the leaves of

an East Indian tree; one of the best remedies for *flatulent colic*, especially when "gouty;" and also for *flying gout* and *chronic rheumatism*.

Dose, from four to ten drops, on a lump of sugar, followed by a drink of water.

Calomel.—Chloride of mercury. See above, under blue pill. Calomel is a white powder. *Dose*, from one-twelfth of a grain, for an infant, to one-half grain, one grain, or sometimes possibly more, for an adult. *Not to be used as a domestic medicine;* unless, after experience, the very small calomel powders, for indigestion of infants.

Camphor.—A most useful gum, from evergreen tree native to the south and east of Asia. Everyone knows its white or colorless transparency, its peculiar odor, and pungent and yet cooling taste. It is volatile; that is, if left in the air it will slowly go off in vapor. Very little of it will dissolve in water. *Camphor-water* is a very mild preparation. *Spirit of camphor*, made with alcohol, is much stronger. Camphor is a composing medicine to the nerves; somewhat more stimulant than assafœtida. In very large doses it is narcotic.

Camphor-water is an excellent tranquillizer for restless babies; being also, like the spices, warming to the stomach, and somewhat anodyne, it is excellent in colic. *Spirit of Camphor* is best when an anodyne effect is specially needed; as in colic of grown people.

Dose of Camphor-water, from a teaspoonful (an infant dose) to a tablespoonful. Of *Spirit of Camphor*, from ten to thirty drops; on sugar, and stirred in water, or in a thick syrup, as spiced syrup of rhubarb. When dropped into water, the alcohol unites with the water and "throws down" the camphor in little white flakes.

Paregoric is a camphorated tincture of opium.

Carbolic Acid.—This has no proper place as a domestic medicine. It has had great popularity as a disinfectant; more than it deserves, in comparison with several other less unpleasant things. Surgeons often employ it in "antiseptic" dressings and lotions,

Cardamon Seeds, *Compound Tincture of.*—A warming aromatic preparation, often added to soda, etc., for sickness of the stomach. *Dose*, a teaspoonful, in water.

Castor-Oil.—Expressed from the beans of the *palma christi*, a handsome plant, originally from Asia. It is nasty, decidedly; but is a good, effective, and yet mild purgative medicine. It is the best cathartic, even for babies, when any *irritation of the bowels* is present; as in threatening of dysentery, and in some cases of colic.

Dose, from a teaspoonful to a tablespoonful. The best way to give it is to stir it well with twice the quantity of *spiced syrup of rhubarb*. So mixed, I have had patients to take it without finding out what it was.

Catechu.—An extract from the wood of an oriental tree. It is astringent, and is very useful in *diarrhœa*. *Tincture* of catechu is the best preparation. *Dose*, half a teaspoonful to a teaspoonful, in water. An excellent medicine to check troublesome diarrhœa consists of equal parts of *tincture of catechu and paregoric;* of this mixture, the dose is a teaspoonful, repeated according to the urgency of the case.

Cerate.—This word means something made with wax. Simple cerate is made of spermaceti, white wax, and oil of almonds. It is a very soothing and healing application to sore places of any kind, as after a blister, etc. It is harder than cold cream (ointment of rose water), and this is sometimes a decided advantage.

Chalk Mixture.—A convenient medicine for common diarrhœa, made of prepared chalk, gum-arabic, glycerine, and cinnamon water. *Dose*, a tablespoonful for a grown person. Most frequently something is added to make it more "binding" or astringent, as catechu, paregoric, etc.

Chamomile.—This is a plant with bitter and aromatic flowers. Of these a tea is made with boiling water. It may be taken, half a pint daily, as a simple appetizer and tonic in weak digestion or general want of strength. It is not, however, one of the strongest tonics.

Charcoal.—Powdered charcoal is a good "sweetener" of a stomach oppressed with flatulence from indigestion. Dose, half a teaspoonful to a teaspoonful. It is often given with an equal quantity of magnesia.

Very finely powdered charcoal is also a useful ingredient in *tooth-powders;* on account of its cleansing action.

Chloral (*cholral hydrate*).—One of the medicines that promote sleep. It is less powerful than opium, although a very large amount of it taken will poison fatally. It is a white crystalline substance, of a pungent taste and color.

Dose, from ten to thirty grains for an adult; for a child, one grain for each year of its age. It should be taken or given only as prescribed by a physician; and when so advised, left off as soon as his judgment will allow. The same sort of danger attends its use as does that of opium, of forming a *chloral habit*, depending upon it for sleep, and requiring larger and larger doses, with at last great injury to the health.

Chlorate of Potassium (chlorate of potash, commonly called).—A favorite medicine with physicians and others, for *sore mouth* and *sore throat*. It often does more good to sore mouths, in babies especially, than anything else. But it must not be swallowed without limitation. While safe in doses of a few grains, half-ounce doses of it are dangerous; sometimes even producing death.

Dose, for a grown person, from ten to twenty grains; for a child, three or four years old, five grains; dissolved in water. Its solution also makes a very good gargle for sore throat.

Chloroform.—The most prompt and powerful, but also least safe, of the articles used by surgeons as anæsthetics; that is, for patients to breathe before and during operations, in order to prevent them from suffering pain. It may be taken into the stomach in larger quantity than by the lungs, without danger. In flatulent colic, it is often very relieving; but no more so than camphor and cuajuput, as well as opium. *Dose*, by the mouth, ten to forty or fifty drops; in a large draught of water, as it is very pungent. A teaspoonful holds more than 200 drops of chloroform.

I have given it to a number of patients in teaspoonful doses, without any bad effect; only sleepiness, like that produced by opiates. A *chloroform liniment* may be safely used as an outward application for rheumatic or neuralgic pains.

Cinnamon Water.—Made from the aromatic bark of the cinnamon tree of the East. It is a pleasant spicy solution, slightly astringent; good with other things in mixtures for *diarrhœa*. Dose, for a child, a teaspoonful.

Citrate of Magnesium.—Commonly taken in effervescent solution. It is about the least disagreeable of all purgative medicines. Apothecaries mostly keep it already dissolved, in tightly corked and wired bottles. More convenient for keeping in a family is the solid *granular* citrate of magnesium: which is to be dissolved when taken. *Dose*, of the bottled solution, a wineglassful (more, or less, according to the amount of purging needed). Of the granular citrate, from a teaspoonful to a tablespoonful. In the latter dose, it is quite an active cathartic; although not so rapid in its operation as some other medicines; and all persons are not alike susceptible to its action.

Citrate of Potassium.—Like the citrate just mentioned, this has for one ingredient *citric acid*, obtained from lemon or lime-juice. This is neutralized by potassium (an alkaline metal) as it may be also by magnesium; in each case making what chemists call *salt*.

Citrate of potassium acts very slightly, if at all, on the bowels. It is used in solution to cool the system and promote secretion from the skin and kidneys in fever. One way of taking it is in neutral mixture (one drachm of this citrate in four fluid-ounces of water); of which the dose is a tablespoonful every two or three hours. Another way is in effervescent solution. (See effervescing draught.)

Cloves, Oil of.—A strong, warming aromatic, from flower-buds of the caryophyllus aromaticus of the East Indies. A hot *tea* is sometimes made of cloves, to be given in cholera-morbus.

If the *oil* should be taken, for colic, its dose would be not more than a drop or two, on a lump of sugar, followed by a drink of cold water. The *tea* may be made by pouring a teacupful of boiling water on half a teaspoonful of cloves, covering and leaving

it to stand for a few minutes. *Dose*, a dessertspoonful (two teaspoonfuls, or half a tablespoonful).

Oil of cloves is a good remedy for toothache in a hollow tooth. Wet a pledget of cotton well with it, and push it into the cavity of the tooth with the end of a bodkin or knitting-needle.

Cocoa Butter.—Cocoa butter is a good soothing application for *bruises* of any part of the body. It is well always to have it in the house.

Cod-Liver Oil.—Obtained, as its name indicates, from the livers of codfish. It is very nourishing and fattening to wasted and wasting bodies, sometimes checking the progress even of pulmonary consumption. Its taste is quite disagreeable. *Dose*, from a teaspoonful to a tablespoonful (the latter best) thrice daily, for a grown person. Many ways have been tried to make it less unpleasant to take; following it with strong mint-drops, mixing it in coffee, rinsing the mouth first with brandy or whiskey, pouring it into the froth of ale, etc. I doubt whether any way (unless it is put up in *gelatine capsules*, is better than to *salt and pepper* it, and then bolt it down; afterwards rinsing the mouth with tincture of myrrh and water. Children generally do not mind taking it, unless their fears have been aroused by talking about it.

Colchicum.—A plant whose root and seeds are both used medicinally. The *wine of the root* is the best preparation. In large dose it acts on the bowels; sometimes irritating the stomach also. It is a diuretic, and influences the nervous system in a way not very well defined. It was formerly the favorite medicine in *gout;* and probably does as much as any medi ine towards curing or mitigating gouty attacks. *Dose* of the wine of the root of colchicum, ten or thirty drops, in water.

Cold Cream.—This is the *unguentum aquæ rosæ* (ointment of rose-water) of the apothecaries. It is a soft, easily melted, and very soothing application for sore places, chapped hands or lips, etc It becomes rancid when long kept exposed to the air.

Collodion.—This is a solution of guncotton in ether. When it is painted upon any surface the ether evaporates, leaving a thin cottony film. *Flexible* collodion, made a little differently, is less apt to shrink together in drying. It is a convenient article to cover a part whose skin is broken or ulcerated, as *sore nipples*, *cracked lips*, etc.

Columbo.—(*Calumba*, root of an African plant) is one of the simple vegetable bitters. Like the rest of its class, it is a tonic to the stomach. It is given sometimes for dyspepsia.

Cream of Tartar (Bitartrate of Potassium.—This is a cooling, mild purgative salt, which also increases the flow of urine (diuretic). It is very often given in *dropsy*. *Dose*, one or two teaspoonfuls, stirred in water. Very little of it will dissolve.

Creosote.—A product of tar. A hot-tasting, sooty-smelling liquid; poisonous if swallowed in moderately large quantity; burning the mouth or skin which it touches.

DIGITALIS PURPUREA.

Physicians advise it in one-drop doses for sick stomach, ulcer of the stomach, etc.

In domestic practice it should be on hand as the most effective remedy for *toothache* in a hollow tooth The end of a bodkin or knitting-needle should be wrapped around with a little piece of cotton, and this be dipped into creosote. Then, carefully, the cotton should be pressed into the hollow of the aching tooth. (It won't hurt, as it at

once kills the sensibility of the exposed nerve-end in the tooth.) If any spills over and burns the gums or lips, rinse at once with cold water. Creosote, so used, does no harm to the teeth.

Digitalis.—*Foxglove* is the common name of the pretty plant whose leaves furnish this medicine. The *tincture* is most used. Physicians give it often when the action of the heart is too rapid, and perhaps irregular. It has also been given in large doses in *delirium tremens*. Its common dose is ten drops, twice or thrice a day. Being diuretic, it is sometimes prescribed in *dropsy*. Its very powerful active principle is *digitalin*. Of this, if taken as a medicine, the *dose* is one-fiftieth of a grain.

Dover's Powder.—Made of *ipecacuanha*, *opium*, and a cooling salt (sulphate of potassium, or some similar compound), this medicine is composing and diaphoretic. Some persons find it agree with them at the beginning of a severe cold, taking it just before going to bed, after a warm mustard foot-bath. *Dose*, ten grains; containing one grain of opium and one grain of ipecacuanha. As this is a full regular dose of opium, it needs to be slept, as well as sweated, off. *Better not* take Dover's powder without the advice of a physician; at least the first time.

Effervescing Draught.—This is a cooling medicine for fever; the carbolic acid gas in it also makes it acceptable to the stomach. It is composed on the following recipe:

Dissolve two drachms and a half of bicarbonate of potassium in four fluidounces of water. To make a draught, pour out a tablespoonful of this solution, and add to it a tablespoonful of water. Then pour into these a tablespoonful of fresh lemon-juice. It will effervesce, and should be drunk at once. If lemon-juice cannot be had, an apothecary may furnish instead a solution containing two drachms of citric acid in four fluidounces of water. A tablespoonful of this, with one of water, may take the place of lemon-juice.

Electricity.—Physicians often advise (or themselves personally apply) different forms of electricity for the treatment especially of *paralysis;* also, for *neuralgia*, *chronic rheumatism*, *old sprains*, *suppressed menstruation*, *lead colic*, and many other affections. Powerful currents or shocks are frequently used to revive persons almost dead from *drowning*, *suffocation*, or *narcotic poisoning*.

Elixir of Vitriol.—*Aromatic sulphuric acid* is another name for this, which is often prescribed as an appetizer; sometimes also for diarrhœa, and occasionally for *hemorrhages*. *Dose*, ten to fifteen drops, in water; best taken through a glass tube, to prevent its touching the teeth; also, for the same reason, washing the mouth out well with water after it.

Elixir Proprietatis (*Elixir Pro.*)—This is an old name for *tincture of aloes and myrrh;* which has a popular reputation as a medicine to bring on the monthly courses when delayed or suppressed. *Dose*, a teaspoonful, in water, twice daily.

Emetics.—Articles which cause vomiting. The most important occasion for their use is when *poison* is known to have been swallowed. Then the quicker and the more thoroughly the stomach is emptied, the better.

Handy emetics in every house are *mustard*, a teaspoonful, or *salt*, a tablespoonful, in a teacupful of *warm*, not hot, water. Let it all be swallowed at once; and follow it in ten minutes with another teacupful of warm water, if it has not in that time taken effect.

Among emetic medicines, *ipecacuanha* is the mildest and safest, and it is usually active enough. In bad cases of croup, with formation of membrane in the throat, *alum* may be added to it. Of powdered *ipecac.* a teaspoonful will usually produce vomiting; of the syrup, a teaspoonful, perhaps needing to be repeated; of the fluid extract, half a teaspoonful.

Tartar emetic (tartrate of antimony and potassium) is too severe and prostrating an emetic for use, at least as a domestic medicine. There are other mineral emetics (sulphate of zinc, sulphate of copper, etc.) which ought never to be used except under medical advice.

Epsom Salts.—*Sulphate of Magnesium*, A very unpleasant medicine to the taste; an active, cooling cathartic. It is (its nastiness apart) useful as a purgative in some inflammatory affections of strong people; for

delicate patients, milder medicines are better. *Dose*, from a teaspoonful to a tablespoonful, dissolved in water.

Ergot: *Spurred Rye.*—A growth on grains of diseased rye plants. When taken into the stomach, it has a tendency to promote contraction of the womb and of the blood-vessels. On account of the first of these effects, it is given after child-birth, to aid in the expulsion of the *placenta* (after-birth), and to check hemorrhage. Its causing contraction of the blood-vessels is a reason for its being prescribed for various hemorrhages, and also in *chronic inflammations;* especially of the spinal marrow. The *wine of ergot* is the preparation most employed. *Dose*, of it or of the *fluid extract*, from half a teaspoonful to two teaspoonfuls, in water.

Eucalyptus.—From the leaves of this Australian tree a *tincture* is made, as well as a solid *extract*, and the essential oil, *eucalyptol*. Lozenges of this drug are serviceable as a *warming expectorant*, in bronchial catarrh. Eucalyptus is also useful in chronic irritability of the *bladder*. *Dose* of the *tincture*, a teaspoonful; *extract*, one to ten grains; of *eucalyptol*, ten to twenty drops, in capsules or a mixture.

Fennel-Seed.—A very mild aromatic; sometimes made into a tea for babies' colic; more often added to *senna tea*, or *fluid extract of senna*, to keep the purgative medicine from griping the bowels.

Flaxseed.—This makes a good soothing drink, flaxseed tea, for sore throat. Pour half a pint of boiling water upon a tablespoonful of whole flaxseed, and stir it up for a few minutes. Then let it stand covered for a few minutes more; but do not put it on the fire to boil, as that would bring out the oil (linseed oil), which is not good to drink. What is wanted in the tea is only the mucilage of the seeds. Lemon-juice and sugar added will make flaxseed tea more agreeable.

Flaxseed *meal* makes a good warm and soft poultice. Mix a sufficient portion of the meal with hot water, into a mushy mass. Spread this with a tablespoon on a piece of thin flannel or old muslin; then double in half an inch of the edge all around, to keep the poultice from oozing out. The best way to have a poultice warm when put on, is to spread it on a hot plate, close by the person to whom it is to be applied. When it is on, cover it at once with a piece of oiled silk, oiled paper, or thin rubber cloth, to keep the moisture in. Without this it will dry up very soon.

A very little sweet oil or fresh lard put over the surface of a poultice before applying it will make it more soothing and more easily removed. For the latter purpose a piece of tarletan or gauze may be laid over it before it is applied. When pain in the part is severe, a teaspoonful or two of laudanum may be poured over the poultice before putting it on.

Fly-Blister.—A plaster of the ointment of Spanish flies (cantharides), applied to draw a blister upon some part of the surface of the body. Such a remedy is only required for a rather severe case of internal inflammation, or for that of an eye or an ear; in either instance, not during the first day or two of the attack. In serious inflammation of the brain, a blister to the back of the neck, or even over a large part of the shaven scalp, is sometimes one of the best of remedies.

A blister is usually made by spreading a piece of buckskin, three or four inches square, with cantharides ointment, covering this with a piece of thin gauze, and laying it upon the part. After from two to five or six hours (according to age and delicacy of the skin) the skin will feel very sore, and on taking the plaster off, the outer skin will be found to be raised in a blister. This may be tapped with the points of a pair of scissors, and the part may then be covered with a rag spread thickly with simple cerate. It will heal in a few days.

For inflamed eyes, the *back of the neck* is the best place for a blister; for severe inflammation of an ear, *just behind* that ear; the plaster being cut to fit there.

Gentian.—A flowering plant, whose root is used in medicine. Its *extract* is made into tonic pills (compound gentian pills) for indigestion, and its *compound tincture* is one of the best tonic preparations given for weakness of the stomach. Gentian is a pure and simple bitter stomachic tonic. Dose of the compound tincture, a tea-

spoonful, in a little water. As an appetizer it is best taken just *before* each meal. If given on account of slowness and discomfort in digesting food, shortly *after* the meal will be the best time for it.

Compound Gentian Pills, have in each pill one grain of extract of gentian, one grain of rhubarb, one quarter of a grain of blue mass, and a quarter of a drop of oil of cloves.

Geranium.—This plant has an astringent root, of which a tea may be made by boiling an ounce (about two tablespoonfuls) in a pint and a half of water down to a pint. Of this the dose is from a tablespoonful to a wineglassful, given as a country remedy for *diarrhœa*.

Ginger.—A fine spice for culinary as well as medicinal use. *Jamaica* ginger is the most used with us. *Essence* of ginger is a very good medicine to have in the house. It is a warming stimulant to the stomach, and aids greatly in relief of ordinary *flatulent colic*. *Dose* of a strong preparation of it (as Brown's essence of Jamaica ginger), ten to thirty drops, in water. It may also be applied outside, over the stomach and bowels; wetting a piece of thin flannel well with it, laying it on, and covering it with oiled silk to prevent too quick evaporation.

Ginger tea is an old favorite stomach-warmer. A tablespoonful or two of the bruised root may have a pint of boiling water poured on it, then leaving it to stand covered for an hour or so. We don't boil *aromatic* teas or other preparations, because that would drive off their *volatile oils*, which are their active principles. Of ginger tea, the dose is one or two tablespoonfuls at a time.

Glycerine.—A sweet, transparent liquid, obtained from fatty substances. Only pure glycerine (Bower's or Price's) should be used. Its principal employment is as an external application; to chapped hands, ears, lips, etc. To a very delicate skin it is, when pure, somewhat irritating. Adding the same amount of rose-water makes a very nice preparation. Glycerine and *borax* mixed make a good paste to put upon sores in the mouth.

In teaspoonful doses, glycerine is gently laxative to the bowels. It is given sometimes for this purpose to children.

Glycerine is *antiseptic;* that is, it tends to keep dead animal matter (meats, etc.) from putrefaction; and to ward off the effects of decay-poison upon or within surfaces of the body. It is therefore a good ingredient in washes for the parts involved after child-birth.

Glycerine with *tannin* makes a very good astringent lotion for frosted feet, also for enlarged tonsils, sore nipples, running from the ears, and fissure of the arms. For the glycerole of tannin, rub together one ounce of tannin (tannic acid) and four fluidounces of glycerine, in a mortar; heat this mixture gently (best in a porcelain dish) until a perfect solution is made.

Gum-Arabic.—A soothing (not nourishing) material for a drink, in cases of irritation of the throat, or cough. It is simply dissolved in water, a tablespoonful to a half pint. Some persons like to chew and dissolve the gum in the mouth for the same purpose, instead of licorice or candy.

Hamamelis Virginiana is the *witch hazel;* principal ingredient in *Pond's Extract*. *Tincture* of Hamamelis is much used by some physicians in England for *spitting blood;* if the blood comes from the stomach, one drop of the tincture in water, every ten or fifteen minutes at first; after a few doses, at longer intervals until relief is afforded. If it be hemorrhage from the *lungs*, the dose of the same tincture may be one drop every hour or two. Larger doses will cause throbbing headache with some persons. It is also given for bleeding from the bowels or from piles.

Hoffmann's Anodyne.—A strong warming stimulant to the nervous system, with some anodyne or pain-relieving power. It is useful in attacks of gout in the stomach or heart, palpitation from or with weakness, *angina pectoris* (which see, hereafter), *asthma*, etc. *Dose*, a teaspoonful, in water.

Hops.– A *Hop-pillow* is sometimes used for sleeplessness. To prepare it, fill a small pillow-case with hops, which have been sprinkled with alcohol to bring out the active principle.

Tincture of Hops, dose a teaspoonful, is a mild hypnotic or sleep-producer. Tincture of *lupulin* (the active principle of hops)

has more power of the same kind; but both are far weaker in this action than opium or chloral and their preparations.

Hot Water.—Hot water, as a means of conveying heat to the interior of the body, is a stimulant to the *stomach*, to the great *nerve centres* back of the stomach, and to the general *blood-circulation*. Hence the efficacy of drinking a goblet of hot water at regular intervals, as preceding each meal. Like *rubbing*, *mustard-plasters*, or other stimulants applied to the *outside* of the body, such internal excitation may make a powerful and often serviceable alternative impression.

Hot water is now much used by surgeons and obstetricians for the *arrest of bleeding*, from injured surfaces, from the womb after labor, etc. For this purpose, it should have a temperature of about 120° Fahr.

Hunyadi Janos Water.—A laxative (mildly purgative) mineral water, sold in bottles. Dose, a wineglassful.

Huxham's Tincture of Peruvian Bark.—A good tonic in feeble conditions of the body, as in slow convalescence from an illness, running down with work in summer time, etc. *Dose*, a teaspoonful, three times a day, in water; best, a short time before each meal.

Hydrochlorate of Cocaine.—A preparation of the active principle of the leaves of the South American *erythroxylon coca*. It has been found, when applied (a few drops of a four per cent. solution in water) to the eyeball, throat, etc., to render the part insensible to pain; so as to greatly facilitate some surgical operations.

Hyoscyamus.—From the leaves of this plant (henbane) are made a *solid extract*, a *fluid extract*, and a *tincture*.

Hyoscyamus is an anodyne; a good deal like opium in its effects on the system, but weaker; and, instead of constipating, tending to act gently on the bowels. Of the extract (solid), the dose is two or three grains. Of the fluid extract, from two to ten or fifteen drops. This last is a very good quieting medicine for the violent coughing spells of severe *whooping-cough*.

Hypophosphites.—Compounds containing phosphorus, in a peculiar state of combination with other medical substances. Much used as an effective tonic, in low states of the system, is the preparation called *Fellows' Hypophosphites*. *Dose*, a teaspoonful, in water, after each meal.

Ingluvin.—An extractive obtained from the gizzard of the common fowl, and, like *pepsin*, used as a tonic to the digestive organs. Some physicans report it to be very effectual in relieving vomiting; especially the "morning sickness" of pregnancy. *Dose*, from three to ten grains.

Inhalation.—This is breathing in vapor of some kind; which is considerably employed in the treatment of diseases, especially of the throat and lungs; as well as (by the use of ether, chloroform, and nitrous oxide), to prevent pain during surgical or dental operations.

Smoking is a simple method of inhalation, acting most powerfully when long pipes (narghileh, chibouk) are used, requiring chest-breathing to draw the smoke through the pipe. Chinese opium-smokers, however, actually inhale the vapor of the narcotic into their lungs.

Fig. 189.

CROUP-KETTLE.

Pure steam is soothing to an irritated throat. It may be inhaled by placing a towel, or a paper funnel, over a kettle which is kept boiling, and breathing the vapor which emerges from the spout. A simple *inhaler* may be made of a wide-mouthed bottle or jar, through whose cork two glass tubes are passed, one straight, the other bent in the middle. The liquid to be inhaled from should not more than half fill the bottle. The straight tube should reach down a little below the surface of the liquid:

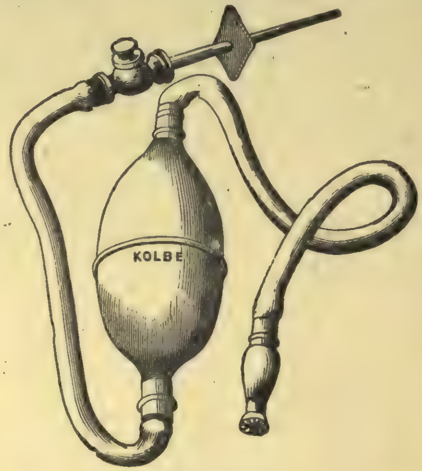
the end of the bent one should stop an inch or so above it. Thus, when the patient draws a breath from the latter, the air which he receives has to pass through the medicated liquid. Tar, creosote, iodine, hops, laudanum, etc., may be thus inhaled. A volatile material, like *ammonia* or *nitrite of amyl* may be inhaled directly from a bottle, small or large. The former of these is a potent stimulant in cases of fainting; the latter (nitrite of amyl), often gives relief in attacks of *angina pectoris*.

Instead of vapor, *fine powders* are sometimes blown into the throat. For sore throat in children, *alum* powder may be thus blown in with a glass tube or a long quill; or with one of the powder-squirts sold by apothecaries for blowing borax, etc., into cracks to destroy insects.

Atomization is the introduction of a very fine *spray* of liquid into the throat and air passages. Such a spray is made by the *odorators* which are used to spread cologne or other perfumes in the air. Instruments are made for atomizing in cases of irritated throat, with which solutions of *ipecac.; chloride of ammonium*, etc., can be applied.

A *cigarette* for medicinal inhalation may be made by the use of a glass tube, six or eight inches long. Near one end of the tube put in a piece of fine soft sponge. Drop into the tube, from the other end, the material to be inhaled; tar, creosote, tincture of iodine, gum camphor, etc. Then insert a second piece of sponge near the upper end of the tube; through this the patient is to breathe for the inhalation. Cotton or tissue-paper will do instead of sponge for the purpose.

Injections (*enema, enemata*).—These are used for various purposes. Most commonly, into the bowels, to empty the lower bowel, when this is considered more prompt and convenient than medicine by the mouth. The old-fashioned way was with a large syringe, holding about a pint. Now, gum-elastic ball-and-tube arrangements are employed, which one can use himself. Only common sense is necessary for the introduction of the oiled end of the tube of either kind; and gradual moderate force to cause the material to enter. It should then be kept by the patient for five or ten minutes, for an effectual operation. Smaller syringes, of course, half or quarter pints, are suitable for children. For a child, warm water alone



ENEMA SYRINGE.

will sometimes suffice. A common mixture for opening injections is made by mixing well together a pint (nearly) of soapsuds (castile soap, at least for delicate persons), a tablespoonful of salt, a tablespoonful of molasses, and a tablespoonful of oil, either sweet or castor oil, according to the case.

Injections are used sometimes to relieve pain, or to check obstinate diarrhœa. Of the former, the most extreme kind of *colic*, passing a *gravel-stone* from the kidney to the bladder, or of a *gall-stone* through the gall-duct, or *strangury*, or threatened *abortion* (miscarriage during pregnancy) are examples. In *dysentery*, as well as in diarrhœa, such injections may be called for; laudanum being most frequently (in all the above-mentioned cases) so employed.

For a grown person, the smallest amount likely to do good in such a way is thirty or forty drops of laudanum. It is best to mix it, for injection, with a small amount of starch (prepared as for the laundry, only thin enough to pass through a syringe), and then to use a small syringe—holding from half an ounce to two ounces only. The object here is to have the material injected to remain in the bowel, as long as it will; so that the anodyne (laudanum) may have time to take effect. Sometimes great suffering will justify sixty-drop injections of laudanum,

or even more; but such had better be used only under the advice of a physician. Other medicines also are occasionally presented for administration in the same way. Now and then four-ounce enemata of *flax-seed tea* are employed in dysentery.

Nourishing enemata are often resorted to, when, for various reasons, food cannot be taken by the mouth. Half or a quarter of a pint will be enough at a time for this purpose; as it is important for it to remain and be absorbed. Beef-tea, milk, or raw eggs beaten up with milk, will be the best materials. Sometimes pure fresh beef's blood is so used. An example of a nourishing injection may be the following:

To five ounces of finely scraped meat, and five and a half ounces of finely chopped sweetbread freed from fat, add three or four fluidounces of lukewarm water. Stir together into a pulp. It will be well to wash out the lower bowel with an injection of warm water, about an hour before introducing a nourishing enema.

It may be mentioned, in view of a possible emergency in the absence of a physician, that the instrument used for hypodermic injection is a small glass syringe made for the purpose, ending in a tube of steel or silver to puncture the skin and introduce the liquid. Having drawn into the syringe the amount to be used, the skin of the part selected (an arm, the back, abdomen, a thigh, or the calf of one of the legs) is drawn up with the forefinger and thumb of the left hand. With the right hand, the point of the tube (after being *oiled*) is pushed almost horizontally through the skin, and then the fluid is rather slowly pressed out of the syringe. The latter is to be withdrawn without twisting it; all must be done so as to cause as little irritation as possible. From one-third to one-half of the dose by the mouth is the quantity of any drug employed in this way. *Anodyne* and *stimulant* medicines are, more than any others, used hypodermically. Sometimes the habit of taking hypodermic injections of morphia is acquired, and is as hard to break as smoking opium or laudanum drinking.

Iodine.—*Lugol's iodine solution*, the *tincture* of iodine, and *iodide of potassium*, all have medical uses; but not, as a rule, in domestic practice. We may except, perhaps, the outward application of *tincture* of iodine, which may be *painted* upon the chest (with a large camel's-hair pencil) for a continual cough (chronic bronchitis), or may be used as a counter-irritant in several other kinds of cases.

Physicians prescribe *iodine* in *Lugol's solution* as an alternative in *scrofula* and in *goitre* (which see hereafter). *Dose*, ten drops, twice or thirce daily, in water. *Iodide of potassium* is a very important medicine in a number of diseases; most particularly and certainly useful in constitutional *syphilis*, and especially of all in *syphilitic rheumatism;* also, in *anuerism of the aorta*. *Dose*, from five to twenty grains, dissolved in water, thrice daily.

Iodoform.—A powerful drug, kept in the apothecary shops in the form of a powder. Sometimes prescribed as an internal medicine in *scrofula*, *ulcer of the stomach*, etc., in one-grain doses; but it is much more often used as an outward application. It is very healing to *foul ulcers*, *wounds* not doing well, *syphilitic sores*, etc.; being antiseptic; that is, corrective and preventive of decay and putrefaction. While, however, a little of the powder of iodoform may be safely sprinkled now and then over a foul sore, to promote its cleansing and healing, it is not safe to use it without limit; as a large amount of it absorbed may be even poisonous. A bottle or box of it ought, when kept, to be labelled *poison*.

Ipecacuanha.—This is an active but mild emetic in large dose. In smaller quantities, it is an excellent loosener of cough (expectorant), and also a promoter of perspiration (diaphoretic). It is one of the best of remedies in *dysentry*, in a way not exactly explained. Used in *powder* (chiefly as an emetic, except when made into *pills*), *syrup* and *wine*. The *syrup of ipecac.* ought to be in every family medicine chest. It is the best first medicine in *croup* and in *bronchitis* (a heavy cold on the chest, with cough at first dry, and needing to be loosened). Also, it will answer as an emetic. *Dose*, to *cause vomiting*, a teaspoonful, repeated in ten or fifteen minutes if it does not take effect. As a *cough-loosener* (expectorant), five to ten drops for an infant, a quarter to

a half teaspoonful for a grown person. While moving about, a quarter teaspoonful will usually be enough; half a teaspoonful will not often sicken the stomach if taken lying down, or just before going to bed. The *wine* of ipecac. is very similar in effect to the syrup, but is rather stronger; and the form of syrup has some advantage for use as an expectorant medicine.

Iron.—There is iron in the blood of every man, woman, and child. Whether we ever have too much of it is not certain; but, without doubt, many thin, pale, and weak people have too little of it. The condition of *poverty of blood* is called, medically, "*anœmia.*" Several preparations of iron are used. The strongest, and also the most convenient to keep and use, is the *tincture of the chloride of iron*. *Dose*, ten to thirty drops, in water. The only objection to it is that it has a disposition to stain the teeth brown or yellow. This may be prevented by taking it through a tube of glass, or of two quills put together. All druggists keep glass tubes for such purposes. The tincture of chloride of iron is somewhat astringent; and therefore is useful in *hemorrhages*.

Syrup of iodine of iron unites the properties and influences of iron and iodine. It is, therefore, an alterative tonic, good in many cases of *scrofula* and in some other chronic complaints. An *alterative* medicine is one which tends to change the condition of an organ, or of the whole constitution; setting up its own innocent and transitory action instead of the disturbing and life-shortening action of the disease. *Dose*, of the syrup of iodide of iron, ten to thirty drops, in water, two or three times daily.

Pill of carbonate of iron (Vallet's mass) is a very good form to make up with *quinine* in treating obstinate cases of *chills* (intermittent fever). Three grains of the pill of the carbonate of iron with one grain of quinine, three times a day, taken for a month, after "breaking" the chills, will cure ninety-nine cases in a hundred of that troublesome affection.

Other "chalybeates," as preparations of iron used to be called (iron *springs* are still called *chalybeate* waters), are: *citrate* of iron, a pretty red salt, not unpleasant to the taste, *dose*, five to ten grains; *phosphate*, a green solid, *dose*, five to ten grains; *solution* (liquor) of the *nitrate* of iron, the most astringent of these preparations, and beneficial in *chronic diarrhœa; dose*, ten drops in water, thrice daily; *solution* (liquor) of *subsulphate* of iron, generally called *Monsel's* solution; a good strong astringent for outward *application*, to aid in *stopping bleeding* from any part.

Jalap.—This is a very active purgative; too much so for common use, but sometimes valuable in particular cases. In *dropsy* it is occasionally prescribed, along with cream of tartar, or with squills. I remember its excellent effect in a very bad case of *scarlet fever*, with stupor and constipation. *Dose*, ten to twenty grains.

Juniper.—The berries of the juniper tree or shrub; used in medicine is as a diuretic in *dropsy*. A tea may be made by pouring a pint of boiling water upon half an ounce of bruised juniper berries, stirring and then leaving it to stand for half an hour before pouring it off or straining it. A tablespoonful of cream of tartar may be added; and at least half a pint of this tea may be drunk (a little at a time) in twenty-four hours, for dropsy.

Compound spirit of juniper is what pharmacists call an "elegant" preparation. It has the advantage of being given in small dose, a teaspoonful or two, in water; and is also, from its stimulant property, best suited to feeble patients, or those with delicate stomachs.

Lactucarium.—An extract from the common garden lettuce (lactuca). It is mildly narcotic and anodyne; promoting sleep like opium, but with much less power. The *syrup* of lactucarium (named *Aubergier's* syrup), is the most convenient preparation. *Dose*, one or two teaspoonfuls.

Lady Webster's Pills.—The important thing in these is *aloes*. They are purgative, and, like other aloetic preparations, have some effect in promoting a tendency of blood towards the pelvic region of the body. They have much reputation as aiding to bring on delayed or suppressed menstruation. *Dose*, one pill, at night. Some persons find half a pill enough to operate on the bowels quite as much as is best. A few will need to take a second pill for such an

effect. It will succeed in a considerable number, but not in all cases.

Laudanum.—Tincture of opium. One of the strongest of the opiate medicines. It is therefore a powerful anodyne and hypnotic (*sleep-producer*).

Dose, for a grown person, from fifteen to thirty drops. In diarrhœa, however, as small a dose as ten drops will often answer. Children are more affected by opiates, in proportion to their age, than by any other kind of medicine. One drop will be more than enough for an infant less than a year old; at least to begin with.

Laudanum is often applied *externally* to relieve pain. On a sound part of the skin, in a grown person, half a teaspoonful may be so applied with safety; but only a few drops at a time, even externally, in the case of a young child.

Anodyne injections into the bowels are most frequently made of laudanum and starch. (See injections.) For *hypodermic* injection (under the skin) solution of morphia is preferred.

In keeping laudanum, it should be remembered that it strengthens with age, by evaporation of some of its alcohol. (All *tinctures* are made with alcohol.) What is left at the bottom of an old bottle of laudanum may be two or three times as strong as a fresh article would be.

Lavender.—Aromatic flowers, well known for their pleasing perfume. The only preparation used as a medicine is the *compound spirit* of lavender. It is an agreeable warming, gently stimulating article; good in *colic*, sometimes for *nausea* (sickness of stomach), and for *dysmenorrhœa* (painful menstruation). *Dose*, a teaspoonful, in water; often given in hot water.

Lead, Sugar of.—A cooling application, often used for *inflammations*. Lead-water may be made by dissolving it in water; but with greater convenience by adding to water the *solution of subacetate of lead* (Goulard's extract), which is a very strong liquid prepation. Of this last one drop to four tablespoonfuls of water will be generally strong enough for lead-water. It may be applied to a much-inflamed *joint*, or (outside) of the *eyeball* or *eyelids*. For the eyes, the best way to use it is with a *camel's-hair pencil*, *painting* the outside of the closed lids frequently with it. It should not be taken internally except under direction of a physician. *All preparations of lead are poisonous*. Care must be taken with them accordingly, that none be swallowed unawares.

Lime-water.—Simply a solution of lime in water. Anybody can make it, by putting pure, clean, unslaked lime in pure water. Take a large bottle, and press into it enough lime to fill about one-fourth of its depth. Pour in water enough to fill it full, then cork and shake it awhile. On standing, the clear lime-water will be ready for use. If all the lime is dissolved, add a little more, so as to be sure that the water is saturated; that is, contains as much as it will dissolve.

Lime-water is the main stand-by as a domestic remedy for vomiting, or for nausea threatening it. *Dose*, from a teaspoonful to a tablespoonful. When nourishment is needed, a tablespoonful of milk may be added to one of lime-water. Otherwise, it may be diluted with an equal amount of water, or cinnamon-water.

Lime-water is often added with great advantage to milk for babies, when they have *sour stomach* or *diarrhœa*, as it is antacid and somewhat astringent. A tablespoonful may be put in every half pint of the child's food, so long as such an occasion exists for it. No harm will be done if it should be taken in that way for days, or even weeks, together.

Liquorice, also spelled licorice.—The root of an herb growing on the shores of the Mediterranean Sea. The *Extract* is chiefly used. It is black, hard, and sweet. There is also a *fluid* extract. Neither has any important property except some soothing influence over the lining membrane of the throat. By "sympathy of contiguity" this influence extends from the gullet into the windpipe, and thus liquorice helps to soften and loosen *cough*.

Lobelia.—The leaves and tops of this plant are employed best in the form of *tincture*. It is a powerful sedative medicine; capable, like tobacco, in large doses, of producing fatal prostration. Its most important use is for *asthma*. It is often very relieving in attacks of that affection. It may be safely given (watching its effects, and

stopping it at once if vomiting or great faintness result) in half-teaspoonful doses, every half hour or hour, until three or four doses, if necessary, have been given. Another way is to give twenty drops of tincture of lobelia, with twenty drops of syrup of ipecac., every twenty minutes, for three or four doses.

Logwood.—The reddish heartwood of a Central American tree. It was once more used than now, as a mild astringent for *diarrhœa*. A *tea* may be made of it by boiling an ounce of it, with a drachm of cinnamon, in a pint of water, for ten minutes. *Dose*, a wineglassful or less.

Magnesia.—A valuable home medicine, as an antacid laxative. It is particularly good when there is *constipation*, with *sick stomach* and *headache*. Even at the beginning of *diarrhœa* and *cholera morbus*, it is many times the best corrective medicine. *Calcined* magnesia is the preferred form. Water does not dissolve it; so it must be stirred well in a little water when taken. *Dose*, a full teaspoonfull for a grown person, if designed to operate on the bowels. Much less will do to relieve acidity and nausea. Magnesia is not a good medicine to take when one has *piles;* as it sometimes produces a *burning* in operating freely. It is not, however, a powerful cathartic. *Citrate* of magnesium has been spoken of on a previous page.

Malt Extract.—Especially in Germany, large use is made of preparations under this name. As sold in this country, some of them are too sweet to agree with the stomach. The best is Johann Hoff's "Malz-Extract;" made in Berlin, and imported in short thick bottles. The use of this extract is as a *tonic*, particularly when digestion is weak. It may be taken at meals, a quarter of a tumblerful at once. When taken at bed-time, it is promotive of sleep.

Manna.—A sweet substance obtained from the trunk of the flowerish ash tree, in the countries bordering on the Mediterranean. Its only important use is to open the bowels of children and delicate people, including women during pregnancy. It may be eaten like sugar. The *dose* is not very definite; a little experience will show how much is required for the desired effect.

Mineral Waters.—These may be classified simply as: 1. Alkaline. 2. Saline. 3. Sulphurous. 4. Chalybeate, containing Iron. 5. Purgative. 6. Limestone or Calcareous. 7. Thermal, *i. e.*, Warm or Hot Springs. While some special properties and effects upon the system in states of disease belong to each of these classes of waters, with differences also among the members of each class, they all agree in exerting an *alterative* influence, which is especially likely to be beneficial in *chronic* disorders. Some waters are largely supplied for particular remedial uses; as the Apollinaris, an agreeable table carbonated (effervescent) drink; Hunyadi Janos, Püllna, and Friedrichshalle, for purgative action; Vichy water (containing soda), to relieve acidity, etc. The most famous mineral waters in our country are those of Saratoga (several kinds, all more or less *saline;* with more or less sulphur also, or iron, iodine, bromine, etc), Sharon (*saline* and *sulphurous*, with some *iron*), Richfield (*sulphurous*)—all these in the State of New York; Bedford (chalybeate, *i. e*, containing iron, and purgative), in Pennsylvania; and a remarkable variety of mineral springs among the mountains of Virginia—White and Red Sulphur, Warm Springs, Hot Springs, etc. In *chronic rheumatism*, *liver* and *kidney* disorders, obstinate affections of the *skin*, and *nervous* troubles of some standing, the best alterative effects from using mineral waters, internally or in baths, may be hoped for. A physician's advice had better always be obtained before they are resorted to in cases of serious disease of any kind.

Morphia.—It is not necessary to have morphia in the family medicine chest; laudanum and paregoric will do for opiates under almost all circumstances.

Musk.—A very strongly odorous substance, secreted by the musk-deer of the Himalaya Mountain region, in Asia. It is antispasmodic, that is, composing to disturbed nerves. Prescribed sometimes for *whooping-cough* and for *convulsions*. *Dose*, five to ten grains, in pill or mixture.

Mustard-Plaster.—One of the most frequently useful of all domestic remedies. When anybody is suffering pain, or, indeed, illness of any kind, if you do not know what

to do, put on a *mustard-plaster*, near the seat of the trouble. Should you not find where that is, put the mustard-plaster on the middle of the back. If properly attended to, it can do no harm ; and in ninety-nine cases in a hundred it will do some good ; sometimes a great deal of good.

To make one, mix from one to three or four tablespoonfuls of mustard (either white or black, so called) with the same amount of wheat or Indian flour. Mix these with enough hot water to make a paste. Then, on a hot plate, near the person who is to have it on, lay a piece of soft old muslin, or thin flannel, twice as large as the plaster is to be ; but spread the mustard and flour paste only on half of the rag. This done, double the other half over it, and stitch the edges together, all around ; or, turn the edges over instead, to keep the stuff in. It may be put on at once, while warm, and left on until it is felt to burn quite smartly, if the patient is conscious. If not, it must be looked under, in a quarter of an hour or so, and, if the skin is decidedly red, take it off. As soon as it is removed, lard, tallow, cold cream, or vaseline should be gently rubbed over it, or a fresh rag spread with one of them may be laid upon the part. We never intend to raise a blister with mustard, it is too severe. The aim is just to heat the skin very actively, mostly for its use as a counter-irritant, to relieve some irritation of an internal organ.

Ready-made mustard-plasters can be had now of pharmacists, and are very convenient. One of them has only to be dipped for a moment or two in hot water, and it is ready to apply at once. It is well always to have a supply of these in the house.

Mush and **Mustard Poultices** are often very useful in inflammatory and other painful affections. They are made with one part of mustard to four parts of mush (of Indian meal) mixed, and applied hot on the chest or abdomen, as required, and covered with oiled silk, or oiled paper, or rubber cloth, to retain the moisture. Such a poultice may stay on for hours, keeping up a moderate and bearable excitement of the skin (warming and counter-irritant) much longer than could be borne with a strong mustard-plaster.

Myrrh.—A gum-resin long known for its aromatic properties. Internally given, it is stimulant and tonic, and is an ingredient in some preparations intended to act upon the bowels or to restore suspended menstruation. For home use, the tincture of myrrh is very serviceable in the care of the mouth. A few drops of it in a little water, say about twenty drops in a quarter of a tumblerful, used as a mouth-wash, will correct a bad odor in the breath. Such a wash may be used with advantage twice daily, in cleaning the teeth. When the teeth begin to decay, a strong myrrh wash, often used, will check or retard their destruction. If a hollow tooth becomes tender, and begins to ache, pure tincture of myrrh put into it will sometimes stop the trouble at the beginning. If, however, it does not at once give relief, the stronger application of creosote should follow it.

Nitrate of Silver, or *lunar caustic.* Physicians often use this as an alterative application to the throat, eyes, or ulcerated skin, in certain states and stages of *inflammation*. It is also sometimes given in pill as a medicine ; most beneficially in *chronic* (*gastritis*) *inflammation of the stomach. Dose*, internally, a quarter of a grain (usually with as much of opium), thrice daily, gradually increased, when it does good, to nearly or quite a grain. It was formerly much employed in the treatment of *epilepsy*. When long continued, it has sometimes dyed the skin, making the face almost as black as ink.

Nitre.—A name for *saltpetre ;* called by chemists *nitrate of potassium*. It is a cooling, sedative salt, when taken internally. In ten-grain doses it is a useful medicine in *acute bronchial* inflammation (bronchitis), and might be added with advantage, more often than it is, to *cough-mixtures* of the loosening kind.

Sweet Spirit of Nitre (*spirit of nitrous ether*) is a liquid preparation, whose properties are gently stimulating, diaphoretic, diuretic, and composing to the nerves. It has long been one of the most popular of domestic medicines for fever. It does the most good, however, in the *least inflammatory* conditions, and, when fever is high, its dose should not be large. Half a teaspoonful of it in a tumblerful of cold water, drunk, a

little at a time, as thirst prompts, through the night, will be more likely to relieve a hot fever, with the coming of perspiration, than a whole teaspoonful taken at once. This is because the large doses "stimulate the circulation above the secreting point," to use an old but true medical phrase.

To *increase the action of the kidneys*, as a *diuretic*, sweet spirit of nitre is very often useful. For this purpose, in the absence of high fever, larger doses will suit than when that condition is present. From half a teaspoonful to a teaspoonful, well diluted with water, will be a diuretic dose for an adult; to be repeated in a few hours, if needful.

Nitrite of Amyl is a powerful agent, used by inhalation, from one to four or five drops only at a time, as a remedy for the attacks or paroxysms of *angina pectoris*. It commonly causes immediate flushing of the face. If used, it should be as soon as the attack (with distress and pain about the heart, and along the left arm) begins.

Nux Vomica.—A poisonous seed or nut whose active principle is the alkaloid *strychnia*. It is best used in *extract* or *tincture*. Both are bitter tonics, with a powerful action on the nervous system, especially the spinal marrow. Leaving what we may have to say about this last action until we come to *strychnia*, it may be mentioned that physicians often find *extract* of nux vomica a good addition, in small dose (a quarter to half a grain), to tonic pills for continued debility. The *tincture*, in ten-drop doses, in water, is an excellent medicine for great *weakness of stomach*, with *flatulence*. Larger doses (if even these) should not be ventured upon without medical advice; on account of the very powerful nature of the active principle of this drug. The tincture of nux vomica should be marked "poison."

Olive Oil.—Probably the gentlest of all laxatives; in teaspoonful to tablespoonful doses. For a delicate infant, needing to have the bowels acted upon, a teaspoonful is very good. The imitation of true olive oil, sold under its name, or as "sweet oil," is less bland, but will answer if the genuine European article cannot be obtained.

Sweet oil, *saturated with camphor* (camphorated oil), makes an excellent application for more or less inflammatory swelling; as for example, a mother's breast threatening to become inflamed while she is nursing; or, more often, when her infant ceases to draw milk, as from illness or the death of the child.

Sweet oil, with an equal quantity of *aqua ammoniæ* (water of ammonia) or aromatic spirit of ammonia, makes *volatile liniment;* an excellent outward application for sore throat.

Opium.—If all the medicines in the world were to be destroyed, except three, and we could choose the three, they should be quinine, opium and iron. The first cures the greatest number of cases of illness; the second gives the happiest relief to severe pain; and the last does the most to build up a debilitated body. Of the preparations of *opium*, *laudanum* and *morphia* have been mentioned. The dose of *opium* in substance is one grain; equal to thirty drops of laudanum, or a full teaspoonful of solution of morphia (not Magendie's solution).

Paregoric is the *camphorated tincture of opium*. Its odor and taste are partly due to the oil of anise-seed with which it is flavored. It contains only one grain of *opium* in a tablespoonful of *paregoric;* being therefore a much weaker opiate than laudanum; which has about four grains of opium in each teaspoonful.

POPPY FLOWER

Dose of paregoric, a teaspoonful, more or less, according to the occasion for its use. In *diarrhœa*, for example, quarter-teaspoonful doses will often answer the purpose. Smaller doses, of course, are suitable to give to *children*.

Pepper.—Of the two kinds used with food, red pepper (*capsicum*) is the more stimulating. It is sometimes given by physicians as a stimulant, in five-grain pills. A much more common use for it is to excite the circulation of the skin, as a rubefacient; a power which it shares (though in less degree) with mustard. In *cholera*, when the skin is cold, rubbing with whiskey and red pepper is one of the best things to restore the circulation. It may be employed for the same purpose in any analogous, low and cold, condition.

Peppermint.—*Essence* of peppermint is a pleasant, warm aromatic; given as good for *colic* and *sick stomach*. *Dose*, ten drops for a grown person; for an infant, from two drops down to half a drop (that is, add one drop to a desertspoonful of water, and give of this a teaspoonful at once).

Pepsin.—Hard to get pure. Given for weak digestion. *Dose*, 5 grains.

Permanganate of Potassium.—This "salt," which gives a beautiful red color to water, has a remarkable action on all organic (animal or vegetable) matter. It is one of the best disinfectants. Five grains of it in a pint of water will make a solution suitable to wash out vessels used in the sick room with patients having contagious or infectious diseases. Internally, permanganate of potassium is highly recommended (in two-grain doses, dissolved in distilled water, twice daily) by some physicians in *amemorrhœa* (delay or suppression of the monthly courses). As it sometimes disagrees with the stomach, it must be used with care, and can hardly be placed among the domestic medicines.

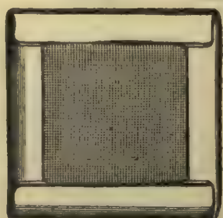
Phosphorus.—Too dangerous for use as a domestic medicine, this is sometimes given by physicians as a powerful nerve-stimulant. *Dose*, one-thirtieth of a grain. Phosphates are safe compounds, often used. Parrish's and Horsford's are very popular tonic preparations. Of the latter (acid phosphates), the dose is half a teaspoonful, in water, just before or after a meal.

Pink-Root.—This American plant (*Spigelia Marylandica*) is a very good medicine for *worms* (*vermifuge*). It may be made into a *tea* thus: Put together half an ounce of broken and bruised pink-root; senna leaves and fennel seed, each two drachms; manna, one ounce; and boiling water, one pint. Let it stand (after stirring) covered for an hour. *Dose*, a wineglassful for an adult, half a wineglassful for a child two or three years old, thrice daily. It is best not to go beyond these doses, as, in very large amount, it acts poisonously. There is a fluid extract of spigelia, also, a convenient preparation; *dose*, a teaspoonful; and still better (because the senna makes it more sure to pass off by the bowels), the fluid extract of spigelia and senna; *dose* of this also, a teaspoonful, repeated every two or three hours until it operates.

Podophyllin, or *Resina Podophylli*—This is an active principle obtained from the root of the common May-apple (*podophyllum peltatum*). The powdered root itself may be taken in doses of ten to twenty grains. Of *podophyllin*, the dose is but from one-sixth to one-half or three-fourths of a grain. It is a powerful, though slowly-acting cathartic; believed also to act more than most purgative medicines on the liver.

Potassa (Potash).—Solution of potassa is sometimes given as a medicine by physicians. *Caustic* potassa (vegetable caustic) is the solid stick, which, with care, may be used to destroy warts. More often, bicarbonate of potassium is employed as an antacid, in ten or twenty-grain doses; and as an ingredient in *effervescing draught* (which see). This bicarbonate is also the *sal aeratus* (gaseus salt) of the bakery; as, like bicarbonate of sodium, it gives off carbonic acid gas when an acid, such as tartaric acid, is added to it.

Poultices.—These are used to warm and soften the skin, when applied to inflamed parts of the surface of the body; particularly when a *gathering* (suppuration, abscess) is expected. Also, they often do good in cases of *internal inflammation* (*pneumonia*, for example) by favoring the return of the blood to the skin, and thus unloading the part troubled with excess of blood.



POULTICE, COVERED WITH GAUZE.

Flaxseed, (linseed), *bran*, *mush*, *slippery-elm bark*, *charcoal*, *chopped carrots*, and *lye*,

are among the materials most needed for poultices.

Flaxseed meal, mixed with hot water, makes a good, soft convenient poultice for common use in "gatherings" of different parts of the body. Mix the meal well with enough hot water to make it hold together and spread easily, and yet not too soft to stay where it is put; a poultice should never run. For use, it should be spread upon a piece of flannel or muslin laid on a hot plate or hot waiter; something hot near the patient, so that it will be warm when applied. The edges of the rag should be turned over, to the width of about an inch, to keep the stuff in, and upon it may be laid a piece of thin and soft *gauze* or tarletan. The latter makes the poultice easier to remove, but is not otherwise necessary. A few drops of sweet oil (or lard oil) may with advantage be poured, or a little vaseline spread, upon the surface of a flaxseed poultice. When *pain* is great, half a teaspoonful to a teaspoonful of laudanum may be poured upon it. As soon as the poultice is put on the part, it should be covered with a piece of oiled silk, oiled paper, or thin rubber cloth, to prevent evaporation, and thus keep it moist. Without this, it will dry and become hard and cold in a little while. *Bran* will do as a substitute for flaxseed meal, when the latter cannot be obtained.

Bread and *mush* poultices are made and applied in the same way. One made with crumbs of *moderately stale bread* and *hot water* (better this always than milk, which may sour unpleasantly) is as soothing to the part as any poultice can be. Powder or slips of *slippery-elm bark* are also very soft, and perhaps more cooling to an *irritated skin*.

A *mush* poultice (of indian meal) is the warmest kind; very suitable for application in *internal inflammations*, as *pneumonia*, *pleurisy*, *dysentery*, etc. It may be made by by using hot mush, prepared just as if it were to be eaten; spread, applied, and covered in the same way as a flaxseed poultice.

In changing or renewing a poultice, be sure to have the fresh one warm, close by the patient, so that the part will not remain for a moment uncovered. Should it do so, the chill caused might more than undo all the good effected by the poultice.

A *charcoal* poultice is only suitable for a nasty, and especially a *mortifying* (gangrenous), part suffering from disease or injury. Finely powdered charcoal should be used; two parts of it with one part of Indian mush. Warmth is not important for this kind of poultice unless the limb or other part affected is cold at the time. Such poultices need to be changed often. *Yeast* poultices are sometimes employed, but I am quite doubtful of their beneficial action.

Lye (ley) poultices may be made by mixing common lye from ashes, or a druggist's solution of potassa, with flaxseed or Indian meal. They are not often used nowadays, being formerly applied to punctured and torn (lacerated) wounds, as a means of preventing *lock-jaw* (tetanus). Better, for this purpose, is *laudanum*, applied directly to the part. If a lye poultice is so used, laudanum should be added to it.

Pumpkin Seeds.—These have a deserved reputation, as capable of driving a tapeworm out of the bowels. For such use, an ounce (about two tablespoonfuls) of the fresh seeds should, after removal of their outer skin, be beaten, with a tablespoonful of sugar, into a paste, then mixed in milk or water, and drunk, either at once or in two draughts half an hour apart. Such a dose should be taken after fasting for from twelve to twenty-four hours, and should be followed in three hours by a tablespoonful dose of castor-oil.

Quassia.– A bitter wood which is a good, simple stomachic tonic, suitable for *dyspepsia*. It is best taken in the form of a *tea*. Half an ounce of it may be boiled for an hour or two in a pint of water. *Dose*, half a wineglassful, two or three times daily.

Quinine.—What is commonly so called and used in medicine is the *sulphate of quinia*. The alkaloid quinia is the most valuable of several obtained from Peruvian bark; that is, the bark of different species of cinchona tree.

Quinine is a bitter tonic; but not a *stomach* tonic only; it acts decidedly, also, on the nervous system. When this is

debilitated, it will do as much good as any medicine, unelss in cases where *iron* or *strychnia* is suitable, to improve its tone. But the heroic value of quinine is in the treatment of malarial fevers; that is, *intermittent*, *remittent*, and *pernicious* (or congestive) fevers. All of these prevail most in the autumn, although considerably also in the spring of the year. All of them are characterized by *periodicity;* that is, more or less regular *spells*, following each other at intervals or periods. *Chills* occur either once a day, or every other day, or on the first or fourth days; sometimes, only once in seven days. Each chill, also, is followed by a fever, and that by a sweat. *Remittent* fever does not go off during the interval, but only remits its violence; hence its name.

So marked is the power of Peruvian bark and its alkaloids, especially quinia, to *stop chills*, and to *cure remittent fever*, that it may be well called a specific remedy, even an *antidote* for them.

Dose of quinine, as a simple tonic in cases of weakness, one or two grains every four hours, until from six to eight grains are taken daily. The form of *pills* is most convenient for this use; one-grain or two-grain pills. For the cure of *intermittent* (chills, ague), more is needed; from twelve to fifteen grains daily for about three days, and then lessening gradually, to ten, eight, and six grains a day, continuing the latter for two weeks. In *pernicious* intermittent, in the Southern States, yet larger doses are required. *Remittent* fever needs the knowledge and judgment of a physician to deal safely with it.

Cinchonia (sulphate) agrees with some persons better than quinine. The latter, in doses amounting to over eight grains daily, makes many people's *ears ring*, or hum, or roar. Cinchonia hardly ever does this; at least, in moderate doses. Quinidia and cinchonidia also suit certain patients the best.

The popular idea that *quinine* injures the health, especially when long taken, is entirely mistaken. If prescribed only in ordinary doses (not more than fifteen or twenty grains in twenty-four hours), it does no harm, and, in malarial cases, may often save life, as well as shorten the time of sickness very much. In *over-doses*, it may cause temporary, or possibly permanent deafness. *Extreme* doses might even kill, by poisonous action on the brain; but such amounts are never given by physicians. I have known quinine to be taken, as much as from six to eight, or occasionally ten, grains daily, by a delicate person, for years together with good action as a tonic, and no disadvantage.

Quinine may be taken in malarial cases, whether there be *fever* or not; for example, in periodic attacks of *neuralgia*. Other diseases, also, in certain localities, take on the periodic form: but for these we must refer to larger medical works.

Rhatany.—This is the root of *krameria*, a South American shrub. It is astringent; its *tincture* is the best preparation. *Dose*, a teaspoonful, in water. Used especially for diarrhœa.

Rhubarb.—The root of an Asiatic and European plant, is a gentle purgative, with

RHUBARB (RHEUM PALMATUM).

also some tonic property, which makes it especially adapted to *dyspeptic* persons, and others disposed to *constipation*. *Dose*, for such a use, from three to six or eight grains. Many people buy the root in pieces, as it comes in the shops, and cut off daily what, on trial, they find to suffice for them. Less trouble attends the use of *simple rhubarb pills;* one or more as may be necessary; if only one, bedtime will be the best time to take it; if two, one at night and one in the morning.

Compound rhubarb pills contain also *scammony* and *aloes* (both strong cathartics),

as well as *myrrh*. They are at least twice as active as simple rhubarb pills.

Simple syrup of rhubarb is a very good opening medicine for infants. *Dose*, for a babe, about a teaspoonful.

Spiced syrup of rhubarb is one of the oftenest useful of all domestic medicines. It contains, besides rhubarb, *cloves*, *cinnamon*, *nutmeg*, alcohol, sugar and water. It is therefore aromatic and gently stimulant, as well as promotive of action of the bowels. This last effect, that of a purgative, is so slight, that it is generally useful in correcting irregular intestinal secretion, and thus curing *diarrhœa*, if given at an early stage. It is also very relieving to *colicky pain* with diarrhœa; and is an excellent "vehicle" with which to mix other medicines of nasty taste, as castor-oil; or those which do not readily dissolve in pure water.

The *dose* of spiced syrup of rhubarb is from a teaspoonful to a tablespoonful; not as a purgative, for which effect the *simple* syrup of rhubarb is better; but to *correct* and *relieve diarrhœa*, especially when accompanied with *pain*, at an early stage.

Rochelle Salts: *Tartrate of sodium* and *potassium*. A not very disagreeable, moderately active, purgative medicine; one of the most convenient and suitable at the beginning of an inflammatory or febrile illness; such as *bronchitis*, *pneumonia*, *measles*, *scarlet fever*, *remittent fever*, etc. *Dose*, from a teaspoonful to a tablespoonful, dissolved in a fourth or a third part of a tumblerful of water.

Santonin.—One of the most effectual vermifuges; that is, medicines which either kill or drive out worms. It must be used with care, as excessive doses are violent in their action; we may say poisonous. For *lumbricord* worms, the commonest kind, one grain will be a dose for an adult; a quarter of a grain, or less for a child. For *seat-worms* (those small ones which inhabit the lower bowel; and cause annoying itching of the *anus* or outlet) suppositories of santonin are the best remedy. These are made of cocoa butter, with two or three grains of *santonin* in each; one being inserted into the bowel at bedtime.

Sassafras Pith.—A very soft material, which gives a soothing (demulcent) property to water in which it is placed. It is often used in this way for *inflammation of the eyes*.

Seidlitz Powders.—Made by mixing bicarbonate of sodium, and tartrate of potassium and sodium (rochelle salt), in powder together, for one paper. For another paper, tartaric acid is put up, in proportionate quantity. When administered, each powder is dissolved in water, and the two solutions are poured together. It is a mild but prompt effervescing purgative, much in use before the invention of the effervescing solution of citrate of magnesium. Each *saline* powder contains forty grains of bicarbonate of sodium (soda) and two drachms of Rochelle salt. Each *acid* powder consists of thirty-five grains of tartaric acid.

Senna.—The leaves of an Eastern plant; an active purgative, with a disposition to give some griping pain in its operation. This may be prevented by adding fennel seed (*an aromatic*) or oil of fennel to it when given.

Fluid extract of senna is a neat and not very unpleasant preparation; with a drop of oil of fennel to each ounce, it is a very good laxative for infants or older children. Fluid extract of spigelia and senna has been mentioned already.

Slippery-Elm Bark has a demulcent property which makes it soothing to an inflamed or irritated part of the body; in *erysipelas*, for example. It is rather heavy to the stomach for internal use to advantage.

Soap.—*Castile* soap is the kind preferred when nicety is particularly desired. This is used by some people to clean their teeth. It is an ingredient, also, in some *purgative pills*, and is commonly employed for laxative *suppositories*, and to make warm *suds* for *opening injections*.

A lather of soap, made as for shaving, and applied with a shaving-brush, is one of the most relieving applications for itching; for example, in poison-vine eruption, or other affections of the skin.

Soap Liniment.—*Camphorated tincture of soap*. An excellent bathing material, so-called; that is, for rubbing a part, to warm and stimulate the movement of blood at and near the surface. It is good for sore-throat, sprains, etc., in this way.

Soda.—*Bicarbonate of sodium* is the chemical name of the article which is used in baking and washing, as well as in medicine. It is an excellent and not disagreeable antacid, relieving sourness of stomach, and often nausea (sickness of stomach) better than anything else. For such a use it may be taken, in small quantities. What would cover a little finger nail, if it would hold it—a *pinch* we may say—is an ordinary antacid dose, although twice as much may be taken for a single time. It is often prescribed by physicians for *gravel*.

Soda water, or mineral water, has no soda in it, but is made by forcing into common water carbonic acid gas, given off by the bicarbonate of sodium in solution, upon the addition of an acid to it, as sulphuric or chlorohydric acid.

Spice-Plasters.—When a child's stomach is sick, or it is obstinately colicky, one of the most helpful things is a spice-plaster. Take of ginger, cinnamon, and cloves, all powdered, each one or two teaspoonfuls; of wheat flour, the same amount. Mix all up together on a hot plate, with enough whiskey or brandy to make a pasty mass. Spread this (not too thickly, on account of its weight) on a piece of thin flannel, with the edges turned in over it all round. When applied to the abdomen (it had better be large enough to cover the whole belly), it should have laid over it a piece of oiled silk, to prevent evaporation. Then it can stay on several hours, and, when dry, may be freshened up again by adding a litle more brandy or whiskey.

Like the spice-plaster in action, is the application of a piece of flannel wet with *essence of ginger*, and covered with oiled silk. This will be somewhat more irritating to the skin of young and delicate children than the spice-plaster.

Squills.—The bulb of an onion-like plant, of which the *syrup* is most used. It is an excellent cough-medicine (expectorant); rather less loosening than ipecac., and therefore suited to a later stage in a bronchial attack. *Dose*, from a half-teaspoonful to a teaspoonful. This syrup should be in every medicine-chest.

In pill, squill is often given as a diuretic (increasing the flow of urine). Dose for this use, one or two grains, three times daily.

Staphysagria.—Stavesacre. A drug used in powder as an effective *parasiticide*; especially to destroy the eggs or "nits" of lice.

Sulphide of Calcium, in quarter-grain doses or less, has the confidence of many physicians as a remedy for *boils*, when one boil keeps following another. A fresh-made solution, of one grain in a pint of water will answer; two teaspoonfuls being taken every hour or two for a few days at a time. *Sulphite of sodium*, in doses of from five to fifteen grains, does good in some cases of indigestion, and perhaps in some of boils or carbuncles.

Sulphur.—This is a mild and good laxative; particularly suitable for piles, and for those persons who are often troubled with colic. *Dose*, a teaspoonful; in molasses or milk. In recent cases of *skin-disease*, it is often given with an equal quantity of *cream of tartar*.

Externally, sulphur is *the* specific remedy for itch; not the only one, but the most convenient and frequently used. It is applied in the form of *ointment*, rubbed well into the seat of the eruption, where it kills the *acarus* or itch-mite, which keeps up the disease.

Sulphur, when burned, gives off fumes of *sulphurous acid*, which is a potent disinfectant. A pound or two of it burned in a large room (with all the people out of it, of course, as the gas cannot be breathed), with the doors and windows closed for two or three hours, will do more to purify it of any contagion or infection than anything else that can be done.

Sulphuric acid, in its pure state, is not used in medicine. *Aromatic* sulphuric acid is the *elixir of vitriol*. This is a good appetizer in ten- or twelve-drop doses, in water. It is also sometimes given for *diarrhœa*; and has some reputation as one of the remedies for *epidemic cholera*. A drink made of it is recommended to workers in lead or lead paint, to prevent the poisonous action of that metal; as the sulphate of lead (compound of lead with sulphuric acid)

is insoluble in water, and without much if any poisonous influence upon the body.

Suppositories are small, soft solids, made for introduction into the lower bowel. Brown soap is sometimes so used instead of an opening injection (enema). A piece of it or of castile soap may be cut of about the size and shape of the last joint of the little finger, and dipped in oil (castor-oil or sweet-oil) for easy introduction. It must be pressed upwards gently until fully within the bowel, and retained for a little while by the contraction of the muscle at the outlet (*sphincter ani* muscle of anatomists).

Cocoa Butter is a very common and convenient material for suppositories, with which are mixed medicinal agents so to be used. *Opium* may be employed, the dose being twice as large as when taken by the mouth. A suppository may therefore contain two grains of opium. *Santonin* suppositories (with three grains of this drug in each) may be used with great advantage for *seat-worms*.

Tannin or **Tannic Acid.**—This is the astringent principle of oak bark, of nut galls, and of many other vegetable materials. Its presence in tea-leaves accounts for iron spoons being blackened when left in tea. Catechu and other vegetable astringent medicines contain tannic acid, some of them also the very similar gallic acid.

Tannin is often given as a medicine in pill for *diarrhœa* and for *hemorrhages.* A good astringent pill is made with three grains of tannin and a little opium, from one-twelfth to one-half a grain of the latter, according to the case.

Tannin is also frequently made part of an astringent *gargle*, particularly in rather *chronic* (prolonged) cases of sore throat.

Tar.—An old-time remedy for *chronic bronchial* trouble; especially likely to do good by *inhalation*. A tin cup containing tar may be kept over a slow flame, in the room with the invalid, so as to give off tar vapor into the air. A good way is to have the cup of tar in a vessel of hot water; the heat acting upon the water, so that it never heats the tar so much as to decompose it. Or it may be used with a simple inhaler. (See Inhalation).

Tar Ointment is a valuable preparation in some *skin diseases*. It will generally cure *ringworm*. For this purpose, it should be rubbed gently but thoroughly over the ringworm at night (the part being, if practicable, then covered with a soft rag, over which is oiled silk), and cleaned off carefully with warm water and castile soap in the morning.

Taraxacum.—Everybody knows the dandelion plant. *Taraxacum dens leonis* is its botanical name. The leaves are liked by some people as a kind of "greens" for the table. The root has long been known, when chewed or drunk in the form of a tea, to act upon the kidneys, increasing the flow of water. Besides this diuretic action, it appears also to aid in relieving torpor of the liver.

Extract of taraxacum is the most convenient preparation. In ten- or twenty-grain does it may be taken by those who have symptoms threatening bilious colic, or who, from nausea, dizziness, a bitter taste, and yellow eyes and tongue, appear to suffer from imperfect removal of bile from the system. It is thus a mild and safe assistant to, or perhaps substitute for, blue mass.

Tarrant's Powders.—A moderately active and not unpleasant cooling purgative. Dose, from a teaspoonful to a tablespoonful, according to the amount of effect desired.

Tartar Emetic.—A very harsh drug in its effects upon the human body, unless it be given in very small doses. Other emetics are always to be preferred when vomiting is to be produced. Its greatest value is in small doses as a sedative and expectorant in highly inflammatory cases of pneumonia or acute bronchitis. From one-sixteenth to one-fourth of a grain for an adult will be enough, every two or three hours. For children, tartar emetic is too prostrating to be used unless for quite exceptional reasons. Coxe's hive syrup, formerly a common medicine for croup, should be excluded from the family medicine-chest, on account of its containing tartar emetic. *Antimonial wine* is open to the same objection; *wine of ipecac.* is similar in effect, but much safer.

Tartar emetic *ointment* is occasionally employed as a powerful counter-irritant,

applied to the chest or spine. It causes a sore pustular eruption, more severe even than that made by croton oil used in the same way.

Turpentine, Oil or Spirit of.—Used occasionally by physicians as a medicine internally, in ten-drop doses, in *typhoid fever* (as an alternative to the diseased bowel) and in *chronic rheumatism;* in larger quantities, even a teaspoonful or more, in cases of *tapeworm*, and as an antidote for *phosphorus poisoning*. Oil of turpentine is very heating, and had better not be taken internally without medical advice.

Externally, it is a good warming application (half and half with sweet oil, if the skin of the patient be delicate) for *sore throat*, pain in the *side* or *back*, etc. It may cause some soreness and a slight eruption, which, however, will soon pass away.

Valerian.—The root of an herb native to the Old World, of which the *tincture* and *fluid extract* are most used. It is a mild nervous stimulant and antispasmodic (composing agent). In *hysterical* cases, and in some cases of *delirium tremens*, it is very serviceable. *Dose* of the tincture, a teaspoonful; of the fluid extract, the same; either being diluted with water when taken.

Valerianate or **Ammonia** is often given, in the form of an *elixir*, in teaspoonful doses, to promote sleep in cases of restlessness at night. Valerianate of zinc is a nerve-tonic; sometimes prescribed by physicians, in one-grain doses, for *epilepsy*.

Vichy Water.—An alkaline (antacid) mineral water of France, more agreeable because of its containing some free carbonic acid gas. It is recommended for *dyspepsia* with sour stomach; for *gravel*, and for *gout;* especially when the last named affects the stomach and digestion. *Vichy lozenges* are sold by apothecaries, being intended to imitate vichy water when dissolved. They are often found serviceable to persons subject to sourness of stomach after eating.

Warner's Cordial.—*Tincture of Rhubarb and Senna* this is, by composition. It is a warming, stimulating laxative to the bowels; good in *gouty* cases, and many others. *Dose*, one or two teaspoonfuls, in water.

Watermelon-Seed Tea is an old remedy for dropsy. It is a diuretic, of considerable power, and quite safe, if it does not always cure. A couple of tablespoonfuls of the seeds may be infused in a pint of hot water, and left covered for an hour or two. It is least disagreeable when taken cold; *dose*, a wineglassful (or less, if the stomach be weak) three or four times a day.

Wild Cherry Bark.—One of our native American medicines, of real value. Like the fruit and leaves of the wild cherry tree, and like peach leaves and fruit-stones, this bark contains principles which, when water is added, make a small quantity of Prussic (Cyanohydric or Hydrocyanic) Acid. This is a decided sedative to the blood-circulation, while wild cherry bark has also somewhat of the tonic property which is more largely possessed by the vegetable *bitters*. It is, therefore, a *sedative tonic*. It is adapted to cases of *bronchial* inflammation, especially in rather feeble persons. I have known it to do good even in *consumption of the lungs*. A *cold infusion* (tea) may be made by soaking pieces of the bark in cold water over night. This may be drunk freely, so long as the stomach is not oppressed by it. But more convenient are the *syrup* and *fluid extract* of wild cherry bark. The *syrup* is an excellent cough-medicine, at any stage of a cough, having a particularly soothing and quieting influence upon the air-passages. It may be taken at first with syrup of ipecac., to loosen the cough; then with syrup of squills, to hasten the cure; and afterward, if need be, when it is well loosened and yet troublesome, with a little paregoric also. *Dose*, a teaspoonful. Much more at a time will sicken some persons.

Wistar's Lozenges. These are made of liquorice, gum-arabic, sugar, oil of anise, and a little opium. They are very quieting to a cough, but, as opium tends to check expectoration, they are not suitable for the early, tight stage; their time is when cough is loosened thoroughly, but is annoying and interferes with sleep at night. From one to four lozenges may be dissolved slowly in the mouth in the course of a night if required.

Many more drugs might be here named, and their properties and uses described. But I think it best to confine our attention to those best tried and known to the medical profession. Others may be read about in medical works.

DOSES OF PRINCIPAL MEDICINES

Acetate of Ammonium Solution	1 Tablespoonful.
Aromatic Spirit of Ammonia	10 to 30 Drops.
Assafœtida, in Pill	3 to 5 Grains.
Assafœtida, Milk	Teaspoonful to Tablespoonful.
Blue Pill	¼ Grain to 3 Grains.
Bromide of Potassium or Sodium	5 to 20 Grains.
Cajuput Oil	4 to 8 Drops.
Calomel	$\frac{1}{12}$ Grain to 2 or 3 Grains.
Camphor, Spirit	10 to 30 Drops.
Camphor Water	Teaspoonful to Tablespoonful.
Cardamom, Compound Tincture	1 Teaspoonful.
Castor-Oil	Teaspoonful to Tablespoonful.
Catechu, Tincture	Half-Teaspoonful to Tablespoonful.
Cathartic Pills, Compound	1 Pill.
Chalk Mixture	Teaspoonful to Tablespoonful.
Chloral Hydrate	5 to 30 Grains.
Chlorate of Potassium	5 to 20 Grains.
Chloride of Ammonium (Muriate of Ammonia)	5 to 20 Grains.
Chloroform, *internally*	5 to 50 Drops.
Cinchona, Sulphate	2 to 3 Grains.
Citrate of Magnesia, Solution	1 or 2 Wineglassfuls.
Citrate of Magnesia, Granulated	Teaspoonful to Tablespoonful.
Cod-Liver Oil	1 Tablespoonful.
Colchicum, Wine of Root	10 to 20 drops.
Cream of Tartar	Teaspoonful to Tablespoonful.
Creasote	1 Drop.
Croton Oil, *internally*	¼ Drop.
Digitalis, Tincture	10 to 15 Drops.
Dover's Powders	10 Grains, at night.
Elaterium	$\frac{1}{16}$ of a Grain.
Elixir of Vitriol	10 to 15 Drops.
Elixir Proprietatis	1 or 2 Teaspoonfuls.
Epsom Salts	Teaspoonful to Tablespoonful.
Ergot, Wine of	Half-Teaspoonful to 2 Teaspoonfuls.
Gentian, Compound Tincture	1 or 2 Teaspoonfuls.
Ginger, Essence of	10 to 30 Drops.
Glycerin, *internally*	1 or 2 Teaspoonfuls.
Hoffman's Anodyne	1 or 2 Teaspoonfuls.
Hops, Tincture of	1 or 2 Teaspoonfuls.
Hunyadi Janos Water	1 Wineglassful.
Huxham's Tincture	1 Teaspoonful.
Iodide of Potassium	5 to 10 Grains.
Iodine, Lugol's Solution	10 to 15 Drops.

Iodoform, *internally*	1 Grain.
Ipecacuanha, Syrup or Wine	10 Drops to 1 Teaspoonful.
Iron, Pill of Carbonate (Vallet's)	3 to 5 Grains.
Iron, Tincture of Chloride	10 to 20 Drops.
Jalap	5 to 10 Grains.
Lactucarium, Syrup	1 or 2 Teaspoonfuls.
Laudanum	10 to 30 Drops.
Lavender, Compound Spirit	1 or 2 Teaspoonfuls.
Lime-water	Dessertspoonful to Tablespoonful.
Lobelia, Tincture	20 Drops to a Teaspoonful.
Lupulin, Tincture of	1 or 2 Teaspoonfuls.
Magnesia, Calcined	1 Teaspoonful.
Morphia, Magendie's Solution	4 or 5 Drops.
Morphia, Solution	1 Teaspoonful.
Musk	3 to 5 Grains.
Nux Vomica, Extract	¼ to ½ Grain.
Nux Vomica, Tincture	10 to 20 Drops.
Opium	1 Grain.
Paregoric	1 Teaspoonful.
Peppermint, Essence	1 to 10 Drops.
Permanganate of Potassium, *internally*	1 or 2 Grains.
Pink Root, Fluid Extract	1 Teaspoonful.
Pink Root and Senna, Extract	1 Teaspoonful.
Podophyllin	¼ Grain.
Püllna Water	1 Tablespoonful.
Quinine	1 or 2 Grains.
Rochelle Salt	Teaspoonful to Tablespoonful.
Rhubarb, in Pill	3 to 5 Grains.
Rhubarb, Simple Syrup	Teaspoonful to Tablespoonful.
Rhubarb, Spiced Syrup	Teaspoonful to Tablespoonful.
Santonin	1 to 3 Grains.
Senna, Fluid Extract	Teaspoonful to Tablespoonful.
Soda, Bicarbonate	2 to 20 Grains.
Squills, Syrup	Half Teaspoonful to Teaspoonful.
Tannic Acid	3 Grains.
Taraxacum, Extract	10 to 20 Grains.
Tarrant's Powders	Teaspoonful to Tablespoonful.
Veratrum Viride, Tincture	3 to 6 Drops.
Warner's Cordial	1 or 2 Teaspoonfuls.
Wild Cherry Bark, Syrup	1 Teaspoonful.
Wild Cherry Bark, Fluid Extract	1 Teaspoonful.

The doses here given are intended, as a rule for adults.

As a guide for the giving of medicines to patients in general we append the following:

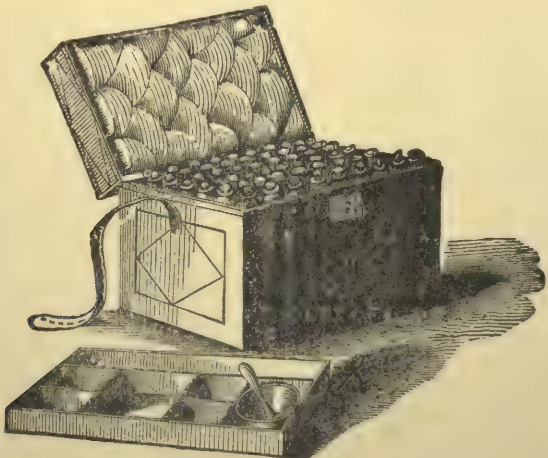
Table of Proportionate Doses.

Age, years	80	65	50	25–40	20	16	12	8	5	2
Doses	⅝	¾	⅞	1	⅞	¾	⅝	½	⅜	¼
Age, months							12	6	2	1
Doses							1-5	1-8	1-15	1-24

Largest Safe Doses of Poisonous Drugs.

Every person should know the largest doses, which is safe to take, of active medicines. The following table shows the largest doses admissible, in grammes, and also the equivalent in grains for solids, and in minims for liquids. The doses are expressed in fractions, thus: 1-13, 1-64, meaning one-thirteenth, one-sixty-fourth. In non-professional hands it is the safest plan to strictly observe the rule of never giving the maximum dose of any medicine:

Medicines.	Grammes.	Grains.
Arsenious Acid	.005	1-13
Acid, Carbolic	.05	¾
" Hydrocyanic	.06	1
Aconita	.0041	1-16
Aconite Root	.15	2¼
Arsenic, Iodide	.025	⅜
Atropia	.001	1-64
Atropia Sulph	.001	1-64
Barium, Chlor	.12	1-64
Belladonna, Herb	.2	3
" Root	.1	1½
Codia	.05	¾
Conia	.001	1-64
Digitalis	.3	4½
Ext Aconite Leaves	.1	1½
" " Root	.025	⅜
" Belladonna	.1	1½
" Cannabis Indica	.1	1½
" Conium	.18	2¾
" Digitalis	.2	3
" Nux Vomica, Alc	.05	¾
Ext. Opium	.1	1½
" Stramon, Seed	.05	¾
Fowler's Solution	.4	6 min,
Lead, Sugar of	.06	9-10
Mercury, Corrosive Chlor	.03	9-20
" Red Iodide	.03	9-20
Morphia and its Salts	.03	9-20
Nitrate Silver	.03	9-20
Oil, Croton	.06	9 10
Opium	.15	2¼
Phosphorus	.015	2-9
Potassa, Arsenite	.005	1-13
" Cyanide	.03	9-20
Santonine	.1	1½
Soda, Arsenite	.005	1-13
Strychnia and Salts	.01	1-6
Tartar Emetic	.2	3
Veratria	.005	1.13
Veratrum Viride	.3	4½
Zinc, Chloride	.015	2-9
" Valeriante	.06	9-10



MEDICINE CHEST.

For the Medicine Chest.

The following household remedies are suggested for the family medicine chest:

Castor-Oil, Essence of Ginger, Spiced Syrup of Rhubarb, Simple Syrup of Rhubarb, Camphor-water, Lime-water, Cinnamon-water, Paregoric, Spirits of Camphor, Spirits of Hartshorn, Laudanum, Syrup of Ipecacuanha, Syrup of Squills, Sweet Spirits of Nitre, Hoffmann's Anodyne, Chalk Mixture Powder, Compound Spirits of Lavender, Anodyne Carminative (Cholera Mixture,) Tincture of Arnica, Soap Liniment, Essence of Peppermint, Spirits of Turpentine, Collodion, Aromatic Spirits of Ammonia, Tincture of Capsicum, Aromatic Sulphuric Acid, Wine of Colchicum, Glycerine.

NURSING AND CARE OF THE SICK

In many kinds of illness, especially continued fevers, and other attacks attended by great debility, good nursing is well known to be as important as good doctoring. A careful physician will direct not only the medicines of the patient, but also his food, and all other matters concerning him—as his covering, changes of clothing, air in his room, etc. But the carrying out of such directions must be left to those immediately in charge of the sick person from hour to hour; and questions will occur in the doctor's absence, sometimes of much importance, which those who nurse the patient must answer and act upon at the moment, from their own knowledge. Moreover, the *manner* of doing things in the care of a sick person makes an immense difference in his comfort. In critical cases it may even decide between recovery and death.

Qualities of a Good Nurse.

What are the qualities that make a good nurse? They are kindness, good common sense, carefulness, quietness, neatness, handiness, cheerfulness.

Kind a nurse must be, or mere professional skill and obligation will fail to effect all that is needed for the best welfare of a patient. Sympathy is worth much to a sufferer. *Patience* is often called for in attendance upon the sick, and selfish people do not have a large stock of this, which can not be bought with money; it must come from love, or, at least, from genuine kindness of heart.

Common sense, that is, intelligence such as most people, not particularly deficient, possess, will enable any one to *learn* what is necessary in nursing, and to do it respectably, at least.

Carefulness is indispensable. One who will give a dose of medicine without looking at the label on the bottle; or will spill out twenty drops when ten were ordered; or will upset a breakfast tray on the bed; or leave a vessel under the bed for hours uncovered; or oversleep when the patient should have food or medicine, or let the fire go out; such an one is entirely unfit to have charge of a sick person.

Exactness in carrying out the orders of the physician is the *first duty* of a nurse. The doctor is responsible for the treatment of the case, and the patient and family are responsible for the choice of the doctor. The nurse, whether man or woman, who thinks he or she "knows better than the doctor," is a very dangerous and unsuitable person to have about the house.

Sleeping heavily is a weakness from which some suffer when in care of ill patients at night. It is a good thing to learn to wake with a sound or a touch. By fixing it strongly on the mind, most people can do this. A break-down may come, just at a critical moment, then the family is left under a calamity which might have been prevented by proper consideration from the start.

Watchfulness in everything is the duty of a nurse. Without it, a patient may get out of bed in a delirium, and perhaps fall down stairs or out of the window. Or, the clothing may be thrown off, and a deadly chill will follow. In a thousand things the life of the sufferer may be in the hands of the nurse, as the safety of the passengers and cargo of a ship is in that of the pilot at the helm.

When many doses of medicine or portions of food have to be given through the day and night, it is best that the times and quantities shall be *written down*, instead of trusting to memory. And then, a mark of record of some kind being made when each thing *is* given makes ready a report of the treatment for the doctor to see when he comes.

Quietness is very necessary in the sick-room. Stamping around in heavy or creaking shoes, talking loud, swinging in a rocking-chair, slamming doors or windows, or even much rustling of garments; *all noises* are utterly inadmissible and injurious. Yet *whispering*, and creeping on tiptoe in sight of the patient, are about as bad, because they attract his attention unpleasantly, and that is always to be avoided.

Never ask a patient whether he would "like to eat or drink" such-and-such a thing. Prepare and bring, under the directions of the doctor, what will be best and most likely to be taken, and offer it quietly.

If not taken in a little while, remove it out of sight. *Keep no food or medicine in sight of a sick person.*

Neatness is a very similar quality to quietness. Nothing should be allowed to be slovenly, much less dirty around a sick person. Yet "fuss" and much movement in clearing up are to be avoided. A wet cloth will be better than a brush or broom in cleaning furniture and carpet.

Handiness is an excellent quality in doing all sorts of things, in the sick-room, as well as everywhere else. While it is not absolutely indispensable, its opposite, clumsiness or awkwardness, may cause much discomfort. I have known one or two men who, in a surgical ward of a hospital, could hardly go near to a patient without somehow hurting him.

Cheerfulness is an excellent attribute in the sick-room. It is as pleasant as sunshine, and wholesome like it, without any of its glare. A long face or a whining voice should never enter where there is suffering enough already. Let every one endeavor to make the best of all things, and the most of hope. When there is doubt, leaning toward the brighter side is well; as the proverb says, "while there is life there is hope,"

Speaking of a patient's symptoms in his presence (unless when needful questions have to be asked) is to be avoided. Also, there must be no discussion or mention there of other people's illnesses or deaths. *Much talking of any kind* is out of place in the sick-chamber; it interferes with that rest of brain which, in all kinds of illness, is important.

The Sick-Room.

When it is possible to choose, the patient's room should be on the sunny side of the house, and on the second floor. It should be one of the largest in the house. If a room is necessarily small, more contrivance will be required to meet all the conditions wanted in the care of an ill person.

Plenty of large windows are desirable in a sick-room. Should there unfortunately be only one window, it will be almost impossible to air the room properly, unless there be an open transom over the door, or the door be left open most of the time. When two rooms communicate, one of them may with advantage be given up to the patient, and the other to the nurse and to various appliances, which may thus be kept out of the sick one's sight.

There should be little furniture in the sick-room. A few chairs and tables will suffice, one being a bedside table for frequent use. A bed-chair (night-chair) or portable earth-closet will be very serviceable for a person who is strong enough to get or be helped out of bed. No carpet should be on the floor, except movable pieces or rugs, placed where they are needed for warmth to the feet and to prevent noise in moving about.

No bed-curtains should be allowed; nor heavy window-curtains. Good blinds or shades are needful to regulate the admission or exclusion of light.

Warmth.

A sick-room should, generally, be kept at a temperature betwen 68° and 70° Fahr. In a few exceptional cases, physicians may wish to have a room much warmer, at particular times. When fuel is scarce, and the room is small, it will be best to secure good air to breathe, even at the loss of some degrees of temperature in the room, this being made up by sufficient covering for the patient. But, in most instances, air may be, with care, kept pure and sufficiently warm at the same time.

The best kind of fire for a sick-room is an open wood fire in the chimney-place. Next to that is an open coal-grate, with a *good draught* to secure it from escape of gas. If only a stove can be had, a wood-burning stove should be preferred. With a stove which burns coal, the greatest care will be necessary to prevent coal gas from getting out into the room, and also to keep the air moist enough by having water in a pan always upon the stove.

Furnace-heated air is objectionable as a dependence in a sick-room, although very well to have within reach to supplement an open fire. The warmth of most furnaces is variable and uncertain; some of them allow gas to get into their air-chambers, and so to pass through the house; and, at the best, they require special pains to provide

ventilation, which the heater itself does not furnish.

For the body of a sick patient to be kept warm enough to be comfortable, is one of the quite indispensable things. It should be ascertained from time to time, especially about the feet. Blankets and quilts will not always insure warmth; they only protect it when the body has it of itself. *Whenever a sick person's feet are cold, something warm should be at once put to them.* A heated fire stone, or a common brick, or a bottle, or pan of hot water, or a bag of hot salt, will do. Only never let your patient be chilled, for a single minute, when it can be helped.

Light.

While the sunny side of the house is the best, and sunlight should be admitted (with few exceptions only) every day into the room, the sick person's eyes should not be exposed to a direct glare. The bed may be so turned that the window is out of the patient's sight; or, if this cannot be, a screen of some kind should be so placed as to shield his eyes from it. At times, when sleep is desirable, the light should be almost all shut out. At night, no flame of a lamp, candle, or gas-burner should be exposed to the patient's view. Either should be shaded, or otherwise concealed. A gas-burner may, of course, be turned down; and, besides, a movable tin burner-shade attached to it is a great convenience. Some persons, even when well, cannot sleep with the flame of ever so low-turned a gas-burner in their sight. It is not safe, moreover, to turn a gas-burner very low. A change of pressure at the source of supply may put out the light, and allow a leakage of gas, dangerous to any one sleeping in the room.

Air.

In the sick-room the things to be done are, to have the air changed constantly, and at the same time to prevent direct draughts upon the patient's bed. If there are several windows, all but the one nearest the bed may be open a little at top and a little at bottom; more or less according to the weather. In warm weather, of course, everything may be opened wide all the time.

With only one window in a room, as already said, there ought to be another outlet for air, such as a transom over a door; or, in the absence of this, the door itself may be left open. This will require attention to the air of the room, or passage, communicating by that door with the room. If the air of the house is foul, that will hurt the condition of the sick-room, when the door of the latter is left open. Yet, somehow, both an *inlet* and an *outlet* are needed, to change the air of the room.

In very cold weather, when it is impossible safely to have (as is always best) a constant and considerable movement of air through the room, the next best thing will be to have chosen *times* of airing it thoroughly. Cover the patient with extra blankets or coverlids, protecting even the head and face for the time; and then open the window or windows and doors wide *for a few minutes*. Upon closing them, see that the patient keeps his extra cover until the room is warm enough again.

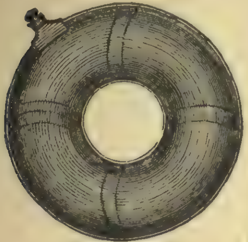
The Sick-Bed.

Select a wide and rather low bedstead, for ease in getting in and out; a wire bed-bottom; next best to it, one on good springs, with a thick but soft mattress. No curtains should be placed around the bed, since they check the free and abundant supply of air to the patient.

Pillows should be of full size, and as soft as possible. Extra little pillows are often useful, to put in spaces, in propping a patient up, to relieve some particular pressure. A sheet, as a rule, not a blanket, should be next to the body. The blanket first is only proper when the patient is very hard to keep warm, or when one quite ill is lifted into and out of a bath. A down quilt is the nicest top-piece; its lightness is a great advantage. Some patients can hardly bear the pressure of the bedclothes. Over an inflamed or injured limb, it is often necessary to put a support to keep them off. This may be made by breaking a barrel-hoop in two, and placing the pieces across each other (fastened at the middle for steadiness) under the clothes.

Changing the bedclothes requires care, but it ought to be done often. When there

is likely to be anything to soil the bed, a large piece of rubber-cloth or oil-cloth should be put upon the mattress, beneath the under sheet. In cases of labor, a second rubber-cloth or oil-cloth had better be placed upon the lower sheet, and another sheet over it, so that the latter and the upper rubber-cloth may be removed, leaving the bed still protected.



AIR- OR WATER CUSHIONS.

Sheets, especially, ought to be changed often. When practicable, once in twenty-four hours will be desirable in a severe illness. To make the change, warm a sheet thoroughly (being sure first that it is *entirely dry;* a damp sheet may be deadly), and fold it lengthwise. Then fold, also lengthwise, one side of the under-sheet on the bed, up against the patient's side. Push the fresh-warmed sheet along near him, and have some one to lift, first his head and shoulders, and afterwards his legs and feet. Then, while he is lifted, press the soiled sheet from under and beyond him, and roll out the fresh one (half of it) to take its place. It will then be easy to draw it smooth. To change the upper sheet, the fresh one, being first warmed, may be rolled either in its width or in its length, and passed *under* the sheet already over the patient's body, into its place, without disturbing him at all. It requires two persons, one on each side of the bed, to do this well.

BEDSORES are very troublesome occasional results of continued pressure, while one is lying long in bed; they are especially apt to occur in very thin and weak persons. Most of all they are liable to happen when, from an injury or serious disease of some part, the patient cannot change his position from time to time. This is the case with fractures of the thigh or leg. In such instances the utmost care must be taken to preserve the soundness of the skin where it is most pressed upon. It must be examined every day, and bathed gently with whiskey or soap liniment. When redness and tenderness of the skin begin to appear, a protection to it must be supplied, by covering the part with a piece of soft, thick buckskin, upon which *soap-plaster* has been smoothly spread; or, if that is not at hand, two layers of adhesive plaster, very *smoothly adjusted* to the surface, will do for the purpose. Small pillows, or air- or water-cushions, in rings or other shapes, are often employed to take the pressure off of tender parts. They may sometimes do good; but, in surgical practice, I have been repeatedly disappointed with them, especially with air- and water-cushions or pillows. When bedsores actually occur, is is *necessary* to relieve the sores from pressure; and, besides, they must be treated like open wounds or ulcers.

Sick-Garments.

These should be as simple as possible. One sufficiently warm and long night-shirt or night-gown will, as a rule, be enough; the less worn, the easier it will be to make changes. If the limbs incline to be cold, light drawers may be added; with the old and feeble, stockings also. Changes of garments worn constantly in bed should be frequent. One "robe" for the day and another for the night would be well, but for the fatigue of so many movements.

There should be no *exposure to cold* during such changes. There need be none, if the room is moderately warm at the time (70° Fahr.) and the fresh garment is well warmed near the bed. One arm should be taken out of the sleeve it is in, and put in the new one; then the old shirt should be lifted off over the head, and the new one put in its place; lastly, the other arm should be changed and the shirt drawn down. When a long gown is ready to put down over the head and shoulders, the old one can be drawn off at the feet.

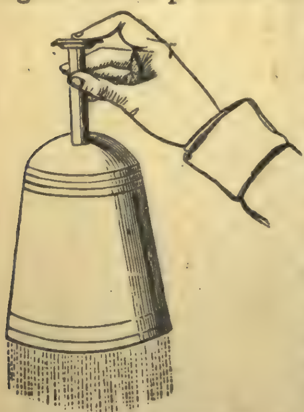
If any garment becomes soiled, it must be removed as soon as possible. There are,

of course, some states of extreme debility in which it is not safe to move the patient so often as above said. But, by having garments made loose, and cut or ripped if necessary to facilitate removal, the refreshment of such changes may be obtained in more cases of illness than many people suppose.

When the disease from which a patient suffers is *contagious*, as small-pox, scarlet fever, measles or typhus fever, every article of clothing worn, as well as the sheets, blankets and bedding, must be (for safety to others) either *boiled* or *burned*. In malignant cases, or those attended by much soiling of the clothes, they had better be burned. In other instances they may be thoroughly boiled, and then spread out in the sun to dry.

Washing and Bathing.

Every morning, at least, a sick person's face should be freshened up by washing, in whatever manner his strength best allows. One really ill must have it done by another person. A soft "wash-rag" may be used. The water may be cold, if there is fever, or if there is not prostration with a tendency to chilliness. In the latter case, warm water is better, even for the face. Warm should be used also to wash the arms and legs and other parts of the body. In weak conditions, whiskey may be added to warm water for bathing the limbs, and pure whiskey or soap liniment should be used to bathe any parts of the skin which are subject to pressure. This is often important to prevent *bed-sores*. If the skin is quite or almost broken, a piece of buckskin spread smoothly with soap-plaster, or a piece of elastic adhesive plaster, or even common adhesive plaster (two thicknesses) may be, as already said, put on to make an artificial protective cuticle.



A SIMPLE SHOWER-BATH.

When fever is hot and high, cool washing of the body is of great value. Some physicians now advise even *cold* baths for typhoid fever. I do not think well of this practice; unless, at all events, the patient is put in water which is at first warm or tepid, and cooled down gradually; also, without exposure to a low temperature for many minutes at a time. But *cool sponging*, in scarlet fever as well as in typhoid, is, without doubt, not only relieving but useful. It may be repeated two or three times daily.

HIP-BATH.

In cases of *low* fever, and other cases in which restlessness at night is a symptom, bathing the arms and legs (one at a time, so as not to chill by exposure) with whiskey and hot water (equal parts) often gives much comfort and promotes sleep.

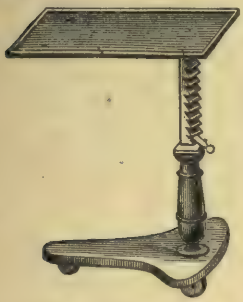
Warm baths are frequently beneficial in states of nervous excitement; as in the *convulsions* of children. Prolonged warm baths are also advised sometimes for *tetanus* (lock-jaw), and to promote the reduction of *hernia* (rupture). In spasmodic *croup* in children, a warm bath is often helpful. *Hot* baths do good in cold or depressed conditions of the system; as in *chronic rheumatism* or *neuralgia;* and when the eruption does not come out or stay out well in *scarlet fever*, *measles*, or *small-pox*.

Hot-air baths, sometimes called Russian baths, must be always taken with *dry* air, so as to allow of free perspiration and evaporation from the body. This so mitigates the effect of heat that many people can bear an air bath above 200° without inconvenience.

Water-baths affect the body chiefly according to their temperature. They may be divided as follows: Cold, 32° to 70° F.; cool, 70° to 85° F.; tepid, 85° to 90° F.; warm, 90° to 96° F.; hot, 96° to 100° F.; vapor, 100° to 120° F.; hot air, 130° to 250° F.

FOOD FOR THE SICK

Appetite almost disappears in severe illness, especially when there is fever; and the capacity to digest food is then nearly lost. It is best not to give large quantities, but keep up the nourishment of the body by giving strong, concentrated food, in the liquid form, in small quantities, at short intervals.



BED-TABLE (WITH RACK)

A young and robust person may, at the beginning of an illness, be better for a day or two with almost no food. *Feeble* patients need, as a rule, to be so fed from the start.

The main staple article of diet for the sick is the same as for infants; namely, milk. And for the same reasons; that it contains all that is essential for the system, in a form easy of digestion and appropriation. In *typhoid fever*, for example, almost from the beginning, a patient may be fed with two tablespoonfuls of milk every two or three hours, day and night. Another concentrated article is beef-tea; and stronger yet, beef-essence. The mistake has been very often made of *straining* or *filtering* beef-tea, after it has been subjected to a boiling heat. Its most nourishing part is thus left behind. It ought to be brown with finely divided particles (not solid pieces, of course) of the meat. The same is true also of *essence* of beef, made without the addition of water.

Next to these articles of food come broths or teas of other meats; as *mutton* and *chicken soups*. They should, for the sick, be made strong, not watery; but should be thoroughly rid of their fat, by skimming. This can be most effectually done when they have stood and become cool; but, except in the warmest weather, they should be heated again to be taken.

Prepared extracts of beef are much in use, to save trouble in getting the fresh article; but try to get those that have not been filtered, as filtering takes out most of the *nourishing* part of the meat, and leaves rather a nutritive *stimulant* than a food.

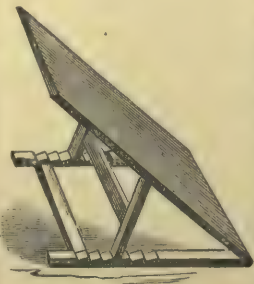
Any *standard beef-juice* which is prepared *without boiling*, has the substance of the beef in a very concentrated state. Most people can take this very well. Two teaspoonfuls of it may be added to about a quarter of a tumblerful of water (hot or cold, as preferred), this being given two tablespoonfuls, more or less, at a time.

Johnson's fluid beef is agreeable to some persons, and, when so, answers a very good purpose. To my taste, it is unpleasant. Many physicians recommend it, and use it largely. *Beef peptonoids* are much used.

Jellies are *weak* food; good only for variety, or to hold something stronger, as a matter of taste.

Fruits are commonly pleasant during fever, but they are most of them rather too hard to digest. *Malaga grapes* will almost always agree well. *Orange juice* (without swallowing the pulp) does so also, and is often very refreshing to the sick. *Lemonade* is pleasant and cooling, but requires consideration of the condition of the stomach and bowels at the time. One of the best things to *clean* a *foul tongue* during fever is *half a lemon*, passed slowly over it now and then.

Stimulants are often added to the diet of the sick, when patients are much prostrated or exhausted. Their use requires great caution and judgment. As a rule, they should not be employed without the advice of a physician. *Wine-whey* and *whisky-punch* are most frequently advised. They are most apt to be appropriate in *typhus fever*, in the weakest cases of *typhoid fever*, and in the *late stages* of severe acute diseases. Also, they may be called for in *cholera*, and in certain conditions which are met with in advanced or advancing *consumption of the lungs*.



BED-REST

Convalescence is generally attended by the return of a good appetite and digestive

power. The system has to make up for what it has lost during illness. Care is necessary that the patient does not venture too soon upon a varied diet, or the use of things hard of digestion. *After typhoid fever*, this is particularly necessary. From the special condition of the intestinal canal in that disease, life may be endangered at that time by a single imprudence in diet. Gradually, however, after most diseases, recovery is marked by ability to eat all ordinary wholesome food, and a variety of digestible dishes may be indulged in, always, of course, avoiding excess.

We shall now give directions for preparing a number of articles especially suited for the food of the sick; those, that is, who cannot properly take ordinary solid meals.* Different things are required for different cases. Of this the physician must judge, when one is in attendance. In his absence, those in charge must be guided by the symptoms and conditions present.

BEEF-TEA—Chop a pound of good lean round of beaf into very small pieces. Pour over it a pint, or *less* (never more) of cold water. Cover it, and let it stand for two hours near the fire, or on a part of the range or stove where it will not become very hot. Then put it right on the fire, and bring it to the boil. As soon as it is fairly boiling, remove it, and take off all the scum from the top. *Pour it off* from the pieces of meat at the bottom, but *do not filter or strain it*, unless through a coarse sieve. Straining robs it of much of its nourishment. The fat must be carefully removed, which can be done best with a clean piece of blotting-paper, or a small (salt) spoon. Salt may be added according to taste; when the stomach is weak, also black or red pepper. In the extreme weakness of *delirium tremens*, red pepper may be *freely* added; a little of it is suitable in nearly every case where beef-tea is needed. Beef-tea should be *stirred* just before using it, so as to get a rich brown color.

BEEF-TEA COLD-MADE.—Chop finely a pound of good beef. Add to it a pint of cold water, in which have been put fifteen drops of chlorohydric (muriatic) acid, and a pinch of salt. Let it stand an hour, and then drain off the liquid. Pour another half-pint of cold water over the beef that is left, and add it to the first quantity. All may be then strained through a coarse sieve, and used cold.

FROZEN BEEF-TEA.—Put a suitable portion of beef-tea, made as above first directed, in a convenient vessel, within an ice-cream freezer. Let it then be frozen as if it were cream. This is particularly suitable in the *summer complaint* (cholera infantum) of children; also in some other cases in hot weather.

BEEF ESSENCE.—Cut up a pound of good lean beaf into small pieces, and put it into a pint bottle (or other handy receptacle), without any water. Cork the bottle *loosely* and place it up to its neck in water in a stewpan. Then *boil* the water in the pan for three or four hours. This will bring out the juice (essence) of the meat, which should be *poured* off, not strained. The fat must be removed as with beef-tea. This is the most concentrated of all articles of food. It is often of the greatest value in conditions of prostration; as a little of it goes a great way, while requiring almost no effort of digestion. Red pepper may usually be added to it in moderation, and salt according to taste.

BROILED BEEF JUICE.—Broil a pound of lean beef. Cut it into strips, and press out the juice with a lemon-squeezer or meat-press. A pound of meat will give about three tablespoonfuls of "gravy" or juice. When salted according to taste, it may be taken either hot or cold, as preferred.

RAW-BEEF EXTRACT.—Cut up good lean beef *very fine*, and put a pound of it with half a pint of cold water in a bottle. Let it soak for about twelve hours, shaking it well half a dozen times or more during that time. Then pour it off through a coarse sieve, and salt according to taste.

RAW-BEEF SCRAPINGS.—Take a piece of good tender beef, and, with a rather dull knife, scrape off all of it that will come, leaving the tough, gristly portions behind. The pasty meat thus obtained may be salted

* To show that fluid food may suffice even for a length of time, I have just read an account of a man who died at the age of eighty-five years, who, when seven years old, swallowed by mistake some strong lye, the effect of which was to contract his œsophagus (lower gullet) so much, that he never afterwards could swallow solid food.

a little and used at once as it is, or it may be rubbed up with half its quantity of granulated white sugar. The latter plan will be likely to suit children best.

Good well-boiled *ham* (as well as *dried beef*) may be treated in the same manner. Infants recovering from summer complaint are sometimes very fond of such food.

CHICKEN BROTH—Clean half a chicken and remove the skin. Pour on it a quart of cold water, and salt to taste. Add a tablespoonful of Carolina rice, and boil slowly for two or three hours. Then skim it well to get off all the fat, and add a little parsley. This is one of the most agreeable of dishes for many sick people.

OATMEAL GRUEL.—Boil a pint of water, and while boiling, mix with it two tablespoonfuls of (Canada, Bethlehem, or Ohio) oatmeal, which has been first rubbed smooth in a little cold water; also, add half a pint of milk, and a little salt. Let all simmer together for half an hour, then strain it through a hair-sieve, sweeten, and add a little nutmeg. A few raisins may be added before the boiling.

INDIAN-MEAL GRUEL.—Stir a tablespoonful of Indian meal till it becomes smooth, in half a teacupful of cold water. Then mix it well with a teacupful of boiling water, and add half as much milk: then boil it until it is moderately thickened. Salt or sweeten according to taste. Raisins may be put in before boiling, if desired.

BARLEY WATER.—Wash well two ounces of pearl barley with cold water, throwing that water away. Put the barley into a pint and a half of fresh cold water, bring it to the boiling point, and boil for twenty minutes in a covered vessel. Strain, sweeten to taste, and flavor with lemon-juice and a little lemon-peel. In certain cases, as in using it to feed infants, the lemon had best be omitted.

RICE WATER.—Boil an ounce of Carolina rice in a quart of water for an hour and a half. Pour off or strain, and add either salt or sugar and nutmeg, according to taste. Salt will generally be best.

TOAST WATER.—Cut a slice of stale bread half an inch thick, and toast it brown all over, without scorching. Pour over it a pint of boiling water; cover closely, and let it cool; then pour or strain it off for use as a drink. Some patients like it better when a slice from an apple, and a very little lemon-peel, are laid on the toast before the water is added.

BREAD-AND-BUTTER SOUP.—Spread a slice of well-baked bread with good fresh butter, and sprinkle it moderately with salt and black pepper. Pour a pint of boiling water over it, and let it stand a few minutes before use. This will do for patients who are not very sick, as a soft article of low diet.

PANADA.—Cut two slices of stale bread, without crust. Toast them brown, cut them up into squares about two inches across, lay them in a bowl, and sprinkle with salt and a little nutmeg. Pour on a pint of boiling water, and let it stand to cool.

VEGETABLE SOUP.—This may be made, of course, in many different ways. The following is about the simplest; put two potatoes, a handful of peas, one ripe tomato, and a piece of bread, into a quart of water, and boil it down to a pint. Then throw in a little chopped celery or parsley, and salt. Cover, and remove from the fire. A delicate stomach may require it to be strained for use.

BOILED FLOUR.—Tie up a quart of wheat flour in a pudding-bag, tightly. Put it into a pot of boiling water, and keep this boiling for several hours (all day or all night will not be too long). Then take out the flour and dry it near the fire. Peel off and throw away the thin outer portion, and grate down the mass, with a nutmeg-grater, into a powder, for use as wanted. One or two teaspoonfuls of this may be rubbed into a paste with a little milk, and then stirred into a pint of milk, which is to be *scalded;* that is, just brought to the boiling-point, without being boiled. This is often beneficial in the *diarrhœas* of infants or older persons.

ARROW-ROOT.—Mix a tablespoonful or rather more with a little cold water, till it becomes smooth and pasty. Boil a pint of water, stir in the arrow-root, and boil it for a few minutes, until it thickens sufficiently. Sweeten to taste with white sugar, unless salt be preferred. A little lemon-peel or orange-peel added before boiling will improve the flavor.

TAPIOCA.—Cover two tablespoonfuls of tapioca with a full teacupful of cold water, and let it soak for several hours. Put it then into a pint of boiling water, and boil it until it is clear and as thick as is wanted. Sugar, nutmeg, lemon, etc., may be used to season it.

SAGO JELLY.—Mix well together four tablespoonfuls of sago, the juice and rind of one lemon, and a quart of water. Sweeten to taste, let it stand half an hour, and then boil it, stirring constantly until clear.

FARINA GRUEL.—Mix two tablespoonfuls of farina with a quart of water, and let it boil long enough to become thick. Add a pint of milk and a little salt, and then boil again for a quarter of an hour, Sweeten according to taste.

RICE MILK.—Boil a tablespoonful of rice for an hour and a half in a pint of fresh milk, then rub it through a fine sieve. Add a tablespoonful of fine (granulated) white sugar, and boil again for two or three minutes.

OATMEAL WITH BEEF-TEA.—Mix a tablespoonful of oatmeal quite smoothly with two tablespoonfuls of cold water. Add this to a pint of strong beef-tea, and heat to the boiling-point, stirring all the time. Boil for five minutes. Then remove from the fire, skim off all the fat, and serve for use.

Other occasional additions to beef-tea, which will agree with all except the most delicate stomachs, are (though not both at once) raw *egg* and *cream*.

GELATINE FOOD.—Soak for a short time in cold water a piece of prepared gelatine two inches square. Boil it, then, in half a pint of water until it dissolves, which will take ten or fifteen minutes. Rub a teaspoonful of arrow-root into a paste with a little cold water, and stir it into the gelatine water at the end of its boiling. Add also from six to twelve tablespoonfuls (according to the child's age) of milk, from one to four tablespoonfuls of cream, and a moderate amount of loaf-sugar.

IMITATION OF MOTHER'S MILK.—Obtain from a druggist packages of pure *milk-sugar* containing, each, seventeen and three-quarter drachms. Dissolve one package in a pint of hot water. Mix together two tablespoonfuls of cream, one of milk, two of lime-water, and three of the milk-sugar water. Warm this mixture, and add it to the pint of solution of milk-sugar in hot water. It is then ready for use.

The packages of milk-sugar, while dry, will keep for a long time. The solution of it should not, in hot weather, be kept on hand for more than a day or two, at most,

EGG BROTH.—Mix two ounces of pearl sago in half a pint of cold water, and let it stand half an hour. Then boil it until it becomes smooth and sufficiently thick. Beat the yolks of four fresh eggs with half a pint of cream; then mix with the sago, and stir the whole well with a quart of beef-tea, or chicken-broth, just made and at boiling heat.

EGG WITH WINE.—Beat up a raw fresh egg, and stir with it one or two tablespoonfuls of sherry wine. This, as well as the preparations that next follow, is only suitable where *stimulation* is required, under the advice of a physician.

CAUDLE.—Beat up a raw fresh egg with a wineglassful of sherry wine, and add it to a half pint of hot oatmeal, Indian meal, or farina gruel. Flavor with lemon-peel, nutmeg, and sugar.

WINE WHEY.—Boil half a pint of milk, and while boiling add half a glass or a glass of sherry or Madeira wine. Strain off the curd through muslin or a sieve. Sweeten the whey to taste, and grate upon it a little nutmeg.

MILK PUNCH.—Into a tumblerful of milk put one or two tablespoonfuls of whiskey, brandy, or rum. Sweeten, and grate nutmeg upon it. In some *very low* states of the system, punch may be directed by physicians made still stronger than this, even as much as a tablespoonful of whiskey to one of milk; but the use of such a powerful means of alcoholic stimulation needs great skill and judgment.

KOUMISS.—This mildly stimulant and somewhat nourishing Tartar and Russian drink is made by fermenting *mare's* milk. It may be quite well imitated, however, by adding to a quart of *cow's* milk a teaspoonful of granulated white sugar, and a teaspoonful of brewer's yeast, and leaving the mixture to ferment in a covered vessel or corked bottle. When this change has shown itself by the bubbles of effervescence,

it is ready for use. If kept for any time, it should be in strong bottles tightly corked (the corks tied down) and in a cool place.

ROAST OYSTERS. — Convalescents can sometimes relish and digest these sooner than any other solid food. Place a dozen fresh oysters in the shell upon a moderately strong fire, and allow them to remain there until their shells open a little. Then take them from the fire, open them at once, retaining the juice if possible, and serve them hot, with perhaps a little black pepper, and salt if needed. If the "hard part" is at all tough, it had better not be eaten.

TO KEEP ICE FOR THE SICK.—Cut a piece of clean flannel about eight inches square. Put this (after making a small hole in the centre) over the top of a glass tumbler, pressing the flannel down to half or more of the depth of the tumbler. Then bind the flannel fast to the tumbler with a tape or cord. When ice is put into this flannel cup, lay over it another piece of clean flannel, three or four inches square. So covered, it will keep for hours, even in warm weather.

FLOUR FOOD FOR INFANTS.—Let from five to ten pounds of selected wheat flour be packed in a bag so as to form a ball, tied with a strong cord, and boiled with the water constantly covering it from four to seven days. The starch appears to be so changed that it is more soluble and more quickly and easily digested. It is not necessary that the water be constantly boiled, provided that it remain hot or warm---the fire may go out at night. The same change may be effected by dry heat, the flour being placed in pans in the oven or on the stove, but it is very liable to be scorched by an excess of heat.

The flour removed from the bag and deprived of its external portion, which is wet, resembles a piece of chalk, but it has a yellowish tinge. The flour should be grated from it as it is required for use, and sifted to separate the small lumps which are likely to be broken off by the sieve. The infant will be better nourished if instead of diluting the milk with which it is fed with plain water, a thin gruel prepared by boiling a few minutes this flour in water, be employed. Two heaped teaspoonfuls of the flour to a pint of water suffice for infants under the age of three months, three teaspoonfuls for infants between the ages of three and six months, and four teaspoonfuls to the pint of water after the age of six months. The proportion of the gruel to the milk should be the same as stated above when pure water is employed.

Giving Medicines.

No one who cannot read should pour out a dose of medicine. Bottles containing poisonous drugs should be labeled poison, and such should, when practicable, be kept apart by themselves; and should, especially, never be left within the reach of children. Before pouring out or otherwise preparing a dose of medicine, look carefully at the label. No medicine should ever be kept in a bottle or other receptacle *without* a label. If a bottle which has contained one medicine is wanted for another, let it be *thoroughly* washed with hot water; and, on putting something new into it, change the label at once. If there is any doubt about the medicine in a bottle, *throw it away*, do not venture to use it without being sure of its nature.

After looking well at the label, before beginning to pour from the bottle, turn the labeled side away, so as not to pour over it; as some drops are apt to run down on the bottle, and might thus stain and obscure the label so that it could not be read.

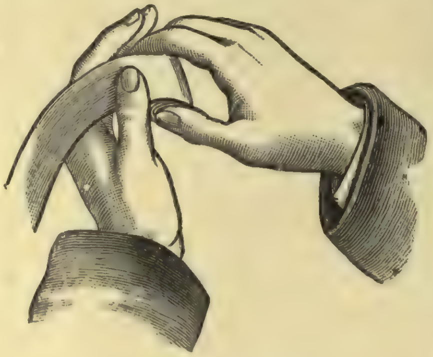
Dropping medicine requires care and skill. To do it, moisten one edge of the top of the bottle with the contents of the bottle, and then, holding and tilting the latter in the right hand, with the left very slowly and cautiously withdraw the cork or stopper, until a drop rolls out. As this comes out, at once push the cork in, and then repeat the same process again and again, until the right number of drops has been obtained.

To give medicine (or liquid food) to a patient too ill to be lifted up in the bed, a *bent glass tube* is very convenient; and so are the half-covered spoons and cups sold by apothecaries. Glass vessels with the quantities marked on them are convenient.

ACCIDENTS AND INJURIES

In all cases of accidents *coolness* and *presence of mind* are of the utmost consequence. Danger is increased by alarm and confusion. One who has his senses about him may, by simple and prompt action, in some instances, avert serious harm.

BANDAGED LIMB.



ROLLING A BANDAGE.

REVERSING BANDAGE.

Bandaging. The purpose of bandaging is to retain certain parts of the body, or "dressings" upon it, in position, without too much pressure; or, sometimes, to make pressure for a time or even continuously.

Material for bandages may be unbleached muslin, about as thick as that which is used for sheets; or soft unglazed linen. It must vary in width and length according especially to the part upon which it is to be applied. For the chest, as for a fractured rib it should be about four inches wide; for the thigh or leg of a man, two and a half to three inches; for the arm, two to two and a half inches; if used for a finger, an inch in width will answer. The *length* may vary from a yard or two to five or six yards in a roll.

How to *roll up* a bandage is a matter of simple management. After doubling an end for a beginning, take it in one hand, between the ends of the thumb and fingers, with the rolled part downwards; holding the bandage then between the side of the forefinger and the thumb of the other hand, so that it may slide between the finger and the thumb of that hand, as it is drawn and rolled up by the fingers of the other. In hospitals they sometimes have a small instrument with which to roll bandages rapidly.

Two rules are very important in bandaging. First, never make any bandage so tight as entirely to check the movement of

blood, unless for a short time (as with Esmarch's rubber-tube compression to prevent hemorrhage in operations) to arrest bleeding; and second, never so apply a bandage as to compress veins in a way to cause swelling *below it*. To fulfil the first of these rules, the feeling of the patient, and one's own common sense, will generally suffice. In regard to the second, the *neck*, of course, must not be so bound as to interfere with the return of blood from the head through the jugular veins; and, when an arm, or any part of it, is bandaged, the *hand also* must be covered; if it be the thigh, or leg, all below it, including the foot, must be equally compressed. Otherwise, the parts below the bandage would swell up, and might, if so kept long, even mortify.

When bandaging the forearm and arm, it is best to begin by passing the bandage around the wrist; then turn it down over the hand and cover it; afterwards go, with *reverses*, up the forearm, and, if necessary, the arm. In covering the lower extremity with a bandage, begin in like manner around the ankle; next go around the foot; and then, with *reverses*, up the leg.

To apply a bandage to any part, take the bandage in the right hand, with the *outside* of the roll held in the palm, and the thumb touching the part which is being unrolled, along the edge of the roll, inside. The left hand is then to fix the end, and succeeding parts, of the bandage in place where it is applied. *Reversing* is done to make the bandage lie smoothly on an uneven surface; as the hand, foot, forearm, leg, etc. It is effected by turning the right hand which holds the roll, so as to obliquely double the bandage, for one or more turns, as required. A little practice will make this easy enough.

Burns and Scalds.—*Burns* are caused by dry heat, or by something else than water; *scalds* by boiling water, steam, or other hot fluids. The danger to life of either is in proportion to their extent of surface, and their depth. Even a superficial burn or scald will kill, if it involve so much as half, some authorities say two-fifths of the body. Death is then produced in two ways; by the *shock*, and by the *arrest* of the necessary functional action of the skin. The *treatment* of burns and scalds is essentially the same for both.

What to do when one's clothes have caught fire, is important. Seize a shawl, rug, mat, coat, or overcoat, if any be within reach, and wrap it closely around the burning part. Or, if not, lie down and roll on the carpet; at the same time crushing the burning garment with the hands. If one sees another person on fire, the same thing out to be done. A man's overcoat, or a rug, etc., may be thrown closely about the victim of the flames, who should be quickly laid down on the floor, so as to be covered more readily and entirely. The reason for this is, that the way to extinguish any fire, large or small, is, to *shut out the air from it*.

When a person is badly burned, the shock to the nervous system is followed by *prostration* or *collapse*. There is great weakness, pallor of face, flickering pulse, short breathing, and coldness of the body. For this condition, *opium*, in the form of *laudanum* (fifteen drops at once, repeated if necessary in an hour, until three or four doses have been taken) is a good stimulus. Small quantities of *whiskey* or *brandy* also, one or two teaspoonfuls at a time, may be given, at half-hour intervals, for a while; to be withheld at once when signs of reaction come. Such signs are, strengthening of the pulse, warming of the skin, and return of color to the face.

Applications for Burns.—For the burn or scald itself, there is no better application than *lime water* and *oil* (flaxseed, olive, or lard oil) mixed together in equal parts. Lint, if it can be had, if not, muslin or linen rags, should be well wet with this, and laid all over the burn. If the burnt surface be extensive, over the lime-water and oil dressing put a layer of *cotton wadding*, for warmth. Should it be a small burn, put instead of this a piece of oiled silk, oiled paper, or rubber cloth.

A burned hand or foot will obtain the best relief by being held in *cold water* for some time. A remedy for limited burns which has lately become popular is, a *saturated solution of soda* (sodium-bicarbonate). Other applications sometimes used are, simple oil (lamp-oil, castor-oil, etc,), and

powdered starch. But nothing is equal in effect to the "carron oil," as the mixture of lime-water and oil has long been called.

When the sufferer's clothing covers the burn, it should be carefully removed by untying, unbuttoning, and cutting everything needful, so as to get all off *without pulling* or much moving the injured body. Raised water-blisters should be merely *pricked* to let out the water; leaving the cuticle to protect the true skin underneath. Then apply the dressing above spoken of. If the patient reacts and does well, the lime-water and oil rags must be renewed when they begin to get dry; taking them off with extreme gentleness, so as to disturb the parts as little as possible. After two or three days, a dressing of *simple cerate*, thickly spread on lint or soft rags, may be substituted for the oily dressing. Deep and extensive burns are sometimes very slow to heal, and leave ugly contracting scars which may require special surgical attention.

Choking; Strangling.—These are not the same in *causation;* but the danger is in both the same—stoppage of breathing by an obstruction in the windpipe. In choking, properly so called, the obstacle is within the throat; in strangling, it is from a cord, etc., outside of and around it; as in *hanging*.

Choking is most frequently caused by getting something "the wrong way" in swallowing. That is, what should go down into the gullet or swallowing throat (*pharynx* and *œsophagus*) gets into the windpipe (*larynx* and *trachea*). The windpipe is just in front of the swallowing gullet; the latter is next to the spine. When one laughs, or in any way breathes, while swallowing, this accident may happen. Even a drop of water going the wrong way, will cause a distressing spasm of the windpipe; but this is over in a few moments. Danger follows when a *solid* mass—as a mouthful of meat,—slips into the larynx; or when a large piece of meat gets stuck fast in the *pharynx* (gullet) so as to press on the *trachea* (windpipe) forcibly enough to keep air from being breatned through it into the lungs. Commonest of all, perhaps, is a fish-bone, or a chicken-bone, getting crosswise, so that it neither goes up nor down. Other things may slip into the windpipe.

No time is to be lost, when any one is choking. A long-fingered person should try to dip a forefinger at once into the throat as far as it will reach, to draw up and out the offending bone, or whatever it is. If it is a child, lift him up by the heels and slap him smartly, while in that position, between the shoulders. Children sometimes swallow pins; they stick, as bones are apt to do, across the entrance to the throat, pretty far up. Surgeons have long slender forceps and other instruments with which to seize such articles and withdraw them. All such things, everything except a piece of solid food in the swallowing throat, should be taken *out*, not pushed *down*. If time allows, a piece of wire may have a loop made in its end, and then be curved near that end, so as to be passed down, behind or below the obstacle, to draw it out. A proof that the thing is in the windpipe is obtained if the person can swallow a drink of water, yet has great distress and difficulty in breathing. This difficulty is great in expiration (out-breathing) as well as in inspiration. A physician being sent for immediately, in an urgent case, fatal suffocation being threatened, may find it necessary to *open* the larynx or trachea, by an incision, in order to save life. If the immediate danger be passed, the question of such an operation may still have to be considered, when a foreign body remains in any part of the air-passages.

Strangling is best known in the form of hanging, which is a frequent mode of suicide. If any one is found hanging by the neck, hold up the weight of the body, and at once loosen the cord at the neck; cutting it will generally be the speediest way, if a knife is at hand. Then lay the person down, and, with as much fresh air around as possible, dash cold water lightly on the face (if it be in a warm place, on the bare *chest* also). Rub the arms and legs briskly, especially *upwards*, to favor the movement of blood in the veins, which is towards the heart. Heat a poker or flat-iron, not quite to a burning heat, but so that a hand cannot rest on it long with comfort; and touch that gently upon the pit of the stomach, and

then draw it along down each side of the back. Apply mustard-plasters to the legs.

But all these things should be got ready and done by the *secondary* assistant or assistants. If a person cut down from hanging does not breathe, he should be laid on his back on the floor or ground, wherever he is, without loss of time. A roll of clothing, like a round knapsack, should be placed under his shoulders; and then *artificial respiration* should be attempted, by Silvester's method. See Drowning.

ARTIFICIAL RESPIRATION.

Drowning.—One whole minute under water will, except with a few practised divers, end life in a human being. Still, by active means, those longer immersed, as much as five minutes, have been restored. It is always worth while and right to give every drowned person the benefit of the doubt, and to work over him for at least an hour, even if no signs of life appear, before giving him up. Drowning kills by exclusion of air from the blood in the lungs; water taking its place. This is said to be an easy mode of death. Those recovered from it describe it as a sort of dreamy sleep, followed by entire un consciousness.

A person has been, we will suppose, a few minutes under water, and is dragged out. At once, on the spot, lay him first on his stomach, and raise his feet a little higher than his head, for a few moments; some one at the same time pressing with moderate force on the sides of the chest. The object of this is to let water *flow out*, if it will, from the lungs.

Next, lay the patient on his back, and put under his shoulders a roll of clothing, such as a rolled-up overcoat, a hard pillow, etc. Draw out his tongue, with a thumb and finger, and get some one to hold it until it can be fixed forward, to prevent it from falling back and closing the entrance to the windpipe. For this fixation a small india-rubber band will be best. If none such is on hand, a paper-cutter, or a small stick, may be held upon the drawn-out tongue, pressing it upon the lower teeth.

Now comes the effort to produce *artificial respiration*. Silvester's method is the best.

Stand or kneel behind his head, and take hold of his arms just above the elbows. Draw them both gently and steadily upwards, over and back of the head, at their full length; and keep them there for a second or so. Then carry them back again to the patient's sides, and press the elbows firmly against his sides, for another second or so. Go on doing this, perseveringly, if necessary, for an hour or more. The object of it is, to promote expansion of the lungs to admit air, by the first movement; and its expansion, again by the second movement.

ARTIFICIAL RESPIRATION

Meanwhile, another assistant should cut the clothing so as to remove it, rub the skin dry, and cover the body with warm flannel.

The legs may be rubbed briskly, *upward*, so as to favor the return of blood in the veins to the heart. Smelling-salts may be now and then held for a few moments under the nostrils. If a fire be near, heat a small flat-iron, or a poker, or shovel, not quite to the burning point, but pretty hot, and touch it gently, again and again, to the skin over the pit of the stomach. This is a powerful mode of stimulation.

When natural breathing begins, stop the arm movements. Continue the rubbing, but also have hot bricks, flat-irons, or bags of sand or salt, bottles of hot water, or anything else warm, laid alongside of the patient's body, and put to his feet. Get him now upon a bed. Shortly, he will recover so as to swallow; and *hot milk* or *hot coffee or tea* will be better for him than anything else.

Ear, Foreign Bodies in.—So disagreeable is the odor of the natural ear-wax, and so sticky is it to insect's feet and the bodies of grubs or worms, that they very seldom find their way into any one's ear; even when sleeping on open ground or in the woods. Once in a great while such a thing may happen. To get an insect out, let the person lie on the other side, and let some one pour in, slowly, cold water. Alarm may then cause it to back out; if not before long the water will drown it. Then the larger part, or the whole (if it be not too soft) may be got out with a pair of ear-picks, or with a hair-pin bent into a scoop at its round end, or a piece of wire bent at one end into a small loop or ring. Particles still left can be washed out with warm water injected from a small syringe.

Children sometimes put peas into their own or one another's ears. Then, water should not be poured in; it would make the pea swell up and give more trouble. Careful use of an ear-pick or bent wire (as above), with a strong light thrown upon the ear-passage, will generally succeed in getting the pea out. A large hand-magnifier, such as is often used to look at engravings, etc., will help in this effort. If a shot has been put into the ear, pour in a teaspoonful of olive or almond oil, and then let the child be turned rather suddenly over, so as to cause the shot to roll or slide out.

Eye, Foreign Bodies in.—Small particles, of sand, dust, cinders, from a locomotive, etc., often get under the upper or lower eyelid; most frequently the latter. If the particle be very small, closing the eyes and blowing the nose hard several times, rolling the eyeballs at the same time, will be apt to work it, by aid of the flow of tears, to the inner corner of the eye; where it can be easily removed. To relieve another person of such an annoyance, first make sure where it is. Open the eye in a strong light, and draw down the lower lid. Use a magnifying glass, if one can be got (a good thing always to have in a house). If you see the speck, a camel's-hair pencil (small paint-brush) will be the best thing to get it out with. Draw the brush *backwards* against it; don't push at it with the point of the brush. If there is no such brush at hand, the corner of a soft handkerchief may be used instead.

Should nothing be found under the lower lid, you must look under the upper one. Seat the person on a chair, and stand behind him; then, with his head leaning back, hold a lead-pencil or pen-holder in the right hand, and, drawing out the upper lid by its lashes, the patient looking downward, you lay the pencil along the lid and turn the latter up over the pencil. It is not difficult, with a little confidence, to do this with a finger instead of a pencil, and standing in front of the patient. While the lid is turned up, look closely to find the intruding particle, and remove it with a brush or a handkerchief, as above described. The eyes must then be kept at rest, closed for a while, to get over the disturbance; otherwise a troublesome inflammation may result. Quite often, when there has been a particle in the eye, but it has been rubbed out, there will still be left a *feeling*, exactly as if it was still there. When this is the case, a careful examination showing it to be so, the irritation will gradually disappear, if the eyes are kept quiet.

Pieces of stone or iron sometimes fly into the eyes and lodge in the front of the ball. Their removal will require surgical skill. A powerful magnet may assist in getting out a fragment of steel or iron from the eye.

After all, to get a *movable* particle out of

one's eye, the best way in most cases will be for the person to open both eyes in a basin of clean cold water; moving the head once or twice from side to side while they are open, so as to wash the particle out of the eye.

Fainting.—One who faints, falls, unless held up, as when standing or sitting up in a crowded place. But not every fall is fainting. It may be an epileptic fit; but then the patient is *convulsed;* that is, his limbs, and perhaps the muscles of his face, *jerk.* There is a modified form of epileptic attack, not common, in which the sufferer lies still; in that, however, the pulse is not so weak as in *syncope* or fainting.

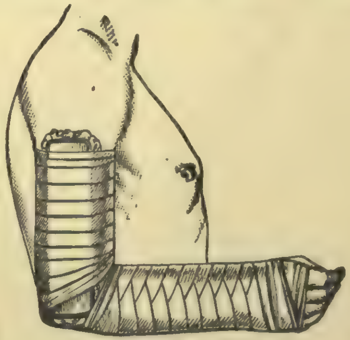
One attacked with apoplexy falls; but his flushed (or at least not pale) face, warm or hot head, slow and full pulse, and slow, snoring breathing, make the case clear. An intoxicated person, or one stupefied with opium, may be found lying unconscious. The odor of liquor in the former, and the contracted pupils of the eyes of the latter, usually serve for distinctions. (Odor of liquor on the breath, however, does not prove that the person may not have apoplexy as well as intoxication.)

In a faint, the face is pale, the forehead cool or cold, the pulse absent or extremely weak, the breathing noiseless and feeble. Once in a while we meet with mixed attacks; almost always in those whose hearts have undergone some degenerative change; in which there is a partial stupor, perhaps with snoring breathing, along with the other signs of fainting. Such an attack differs from apoplexy in that it soon passes off, and leaves no palsy after it. But such spells are comparatively rare.

Fainting is most common in young women; next so, in weakly old people of either sex. In these last it is most dangerous, and may in them easily end in death. What happens in a faint is this; the heart gives out, and sends no fresh blood to the brain; the brain fails, therefore, to maintain consciousness, and the person falls. This fall is advantageous, because it causes more blood to flow to the brain, and, consciousness being renewed, the heart also having less laborious work when the body is level, all starts again. A crowded and close room is a frequent place for fainting. Fright, the sight of blood, and other mental causes, as well as fatigue, may produce it, in those liable to it. Some persons never faint, through a long lifetime; others do so often, even on very small occasions.

What to do for fainting? Lay the person down at once. Get the crowd, if there be one, to move away. Open the windows, or carry the unconscious patient (horizontally) out into the fresh air. Sprinkle cold water on the face; loosen everything about the neck and chest; hold smelling-salts, for a moment at a time, under the nostrils. An ordinary syncopal attack will thus soon pass away.

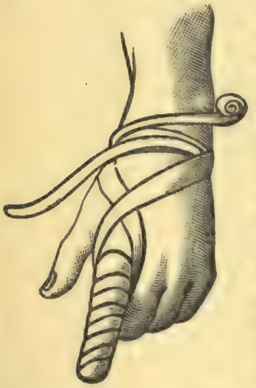
Fractures.—*Broken Bones.*—Most frequently broken is the *radius;* the thumb-side bone of the forearm, which is most closely connected with the hand. We may break it by falling on the hand with force. In the same way also the *ulna* may be fractured; the other bone of the forearm. Next often broken is the bone of the *arm* (humerus) above the elbow; and frequently also the *clavicle*, or collar-bone. After these (besides fractures of the *fingers*), come fractures of the larger bone of the leg (*tibia*, shin-bone) below the knee; the thigh-bone (*femur*); of the ribs; of the knee-pan; and of the nose, lower jaw, and skull.



BROKEN ARM IN SPLINTS

We know a bone to be broken by the change in its shape; the pain caused by every movement; and the crackling noise (not loud), and crackling feeling to the touch, produced when the parts are moved. A broken limb is generally shortened; the muscles above and below the place of fracture drawing the two pieces so as to overlap

each other. When the break is near a joint, it is sometimes difficult to be sure whether there is a fracture or a dislocation. This difficulty is much increased when swelling and inflammation follow, some hours after an injury. In examining to determine a change of shape in a limb, always compare it with its own fellow, on the opposite side of the body. The two are almost sure, when sound, to be alike; and if not so after one is hurt, this will help us to an understanding of the case. There is a change of shape also in *dislocations;* but in them the bones cannot be moved without great resistance; there is no crackling (crepitation) heard or felt; and when the bone is put back in its right place, it will stay there.



FINGER BANDADE, AND FIGURE OF 8.

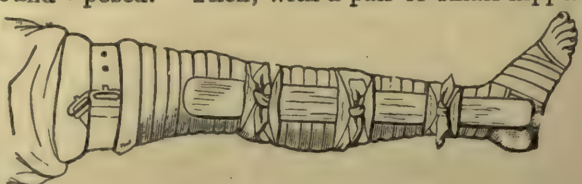
The most serious fractures are those called *compound* fractures; in which there is a wound of the flesh, communicating with the broken ends of the bone. Sometimes one end of a fragment is forced quite out through the skin.

In the *treatment* of fractured bones, the two aims are, to get the broken parts into their right places again, and to keep them there until they "knit together." This takes place by a natural process of growth, exactly like that by which a wound is healed on the surface of the body. A thick colorless fluid, *plastic lymph*, is poured out around and between the ends of the fragments of the broken bone. Gradually this fluid is, between those fragment-ends, changed to gristle (cartilage); and, in time, that gristle becomes solid bone. In one bone, when broken, the *knee-pan* (*patella*), it seldom gets beyond the stage of gristle or cartilage; because that bone, from its situation, receives too little blood to enable it to grow or repair so well as other parts.

Putting a broken bone back to its right shape is called "setting" the bone. This is done, in most instances, by *stretching* the limb, so as to overcome the shortening action of the muscles; and at the same time adjusting the fragments by proper pressure near the place of fracture. After this has been effected, as nearly as possible, some means are needed to hold the parts in the same position. For this, *splints*, *bandages*, *adhesive plasters*, etc., are used. No unprofessional person should venture, if avoidable, to carry out the treatment of a broken bone without the aid and direction of a surgeon.

Joints, Sprained.—Any of the joints may be wrenched or sprained, without actual displacement. This happens often with the ankle, knee, wrist, elbow, fingers, etc. The ligaments are then stretched, and some of their fibres may be torn or broken. Hence follows more or less inflammation, and lameness until the ruptured ligaments have time to heal again. Since the "fibrous tissue" of which they consist has only a low grade of vitality, and not much blood is given for nourishment of the joints, this process of repair in them is slow. A sprained ankle or knee may be longer in getting well than a broken leg would be. At least this is apt to be the case unless the sprained joint has given to it the best chance possible from the first. This is to be had by the patient giving up to rest it completely as soon as it is hurt. This inflammation may be averted or kept low, and a moderate sprain may get well in a few days.

Nail, Splinter under.—To get out a splinter which is beneath the nail, *pare* the nail carefully, over the splinter, making a narrow groove, until its upper end is exposed. Then, with a pair of small nippers or tweezers, or less easily with a thumb and finger, one may seize and draw it out. When a nail is injured or destroyed, it grows from above, that is in the direction of the length of the finger or toe, downwards



BANDAGE AND SPLINT ON LEG

or forwards. This can easily be observed on watching the change of position of marks made and left by the injury, as the nail is gradually restored.

Needle penetration.—A needle gives almost no pain in entering the flesh anywhere; and it may slip about and be pushed by the muscles in various directions, so as to come near or through the surface far from where it entered. If a needle should happen, in such wanderings, to reach the heart, it would no doubt so affect its movements as to cause death; but that is extremely unlikely to happen. Still, nobody wishes to have even so small and smooth a thing slipping about in his body. If a needle, or part of a broken one, is known to enter the skin, a doctor had better be asked to try to get at it, if it has not already passed beyond being reached by a small incision. The same may be said of bits of broken glass. If not seen and removed when first getting in, they may remain a long time without much irritation or disturbance.

Nose, Foreign Bodies in.—Children now and then push peas, small marbles, etc., into their own or one another's noses. If the intruding thing be not very large, blowing the nose very hard, while the other nostril is closed by pressure, may force it out. If not, a piece of wire (a hairpin will do) may be bent so as to form a small round loop at its end, and this (first being oiled) may be gently pushed up around and behind the offending object, to draw it down. Should this not succeed, the aid of a surgeon must be obtained, who will use slender-bladed but strong forceps, made for such emergencies.

Swallowing *indigestible things* gives alarm in many cases where there is little danger of real injury. *Pins* are apt to be swallowed when held in the mouth, which is a very imprudent thing to do; but they will more often stick across the upper part of the throat than go down. (See Choking.) When a pin is actually swallowed, there is reason to believe that it is almost sure to find its way at last through the bowels and out with the discharges. If a *horn* button, or a piece of india-rubber, or a marble, is swallowed, it will be pretty sure to take the same course in time. None of those things are poisonous. A metal button, however, as one of brass, or a copper coin, as a penny, is much worse. Such a thing may pass safely through; but if it stays in the stomach or bowels, gradually corroding, it will poison the system, perhaps, fatally. From such a result, no medical skill can provide escape; unless, when such a thing is known at the time to have been swallowed, prompt dosing with an *emetic* will bring it up with vomiting. A teaspoonful of powder of ipecacuanha, or a teaspoonful of syrup of ipecac., repeated in ten minutes if necessary, and followed by a large drink of warm (not hot) water, will answer for this purpose. If no ipecac. is at hand, a tablespoonful of salt, or a teaspoonful of mustard, in a teacupful of warm water, will do.

It is not worth while to give an emetic on account of the swallowing of *non-poisonous* indigestible solids. Nor is it best to give, on their account, an immediate dose of purgative medicine. Let the person eat rather heartily of *soft food*, as mush, pudding, tapioca, etc.; and the next day, if the bowels are not free, he may take a moderate dose of castor-oil. While, however, such things, in a majority of cases, do no considerable harm, exceptions to this do occur. On the whole, it is well to use our senses of touch, taste, and sight carefully, knowing what is in the mouth always before we swallow it. Among other things, when eating canned vegetables, fruit, etc., take care not to swallow bits of soldering metal, such as now and then become loosened in the can. As these contain lead, they may produce lead poisoning. This has been known to happen.

Wounds.—These may be either *Bruised*, *Crushed*, *Cut*, *Lacerated* (torn), *Penetrating*, or *Poisoned* wounds.

Bruises are familiar to everybody. If the blow or fall has been of such moderate violence as to injure only the surface of the head, body, or limbs, it is not a serious matter. Some blood will be forced out of the small vessels; swelling and discoloration will follow. It will be first red, then almost black and blue, and at last dull yellow or yellowish-brown This is the history

of a "black eye," or of a bruise of any other part. Early use of a soothing application will do the most good. There is nothing better for this than cocoa butter, or "camphor ice." Arnica has a reputation for bruises far beyond its desert. When a bruised part becomes painful, a cloth wet with lead-water and laudanum will be suitable. Later, bathing with soap-liniment will hasten the absorption and disappearance of the blood-deposit which causes the discoloration.

Crushed wounds are much more serious, often endangering life. Such, affecting the

PRESSURE ON ARTERY OF ARM.

SPANISH WINDLASS.

head, will cause fracture of the skull. Falling on the chest, ribs may be broken; or, worse, the heart or lungs may be so pressed as to kill at once or shortly. When a limb is crushed in a railroad accident, it may be wholly or partly severed from the body. We might expect great bleeding in such cases; but it does not occur; the arteries are paralyzed, and bleed little or none, even when torn across. The immediate danger then is from *shock*, going down into fatal *collapse*. When this is recovered from, the injured limb must be dealt with according to the methods of surgery. Amputation is often called for; the damage being too great for the limb to be possibly saved.

Shock constitutes the greatest immediate danger in all crushing injuries. Afterwards, there may be inflammation (or perhaps mortification) of internal organs involved; lungs, liver, stomach, kidneys, peritoneum, etc. Such cases will require perfect rest in bed, with treatment which can only be judged of by an experienced practitioner of medicine or surgery. *Tetanus* (lockjaw) occasionally follows a crushing injury.

Cut wounds are dangerous at first through *bleeding*. Bruised, crushed, and torn wounds bleed, as a rule, very little. Much difference exists as to *what* is cut in an incised wound. If only small vessels, the capillaries, are divided, the blood flows steadily, of a moderately red color, being a mixture of arterial and venous blood. If a *vein* is cut, the flow is steady, and the color of the blood is *dark*-red, almost blue-black or dark-purple. When an *artery* has been cut, *bright* red blood comes out in *jets*, timing with the pulsation of the heart in pumping blood through the arteries.

PRESSURE ON ARTERY OF THIGH

Whatever the source of a flow of blood from a cut wound, we should endeavor (after cleaning out, best with a stream of cold water, any *foreign bodies* in it) to stop the hemorrhage by putting and holding the edges of the wound together. *Pressure* may then be added, so far as needful and available. Over a solid bone, as the skull, this will always be practicable. Bleeding even from a divided artery of the scalp can always be checked, by firm pressure on the vessel against the bone. A *compress* may be made by folding up a fragment of

handkerchief, or rag of muslin or linen, into a thick piece an inch square. Laying this right over the source of the bleeding, it may be kept in place by the firm application of a bandage around the head.

To stop bleeding from a vein, large enough to be seen, when pressure at the wound will not do it, the rule is to press just *below* the wound; that is, on the side *farthest from the heart;* as the blood flows in the veins *from* the extremeties *towards* the heart.

When an *artery* bleeds, and pressure *at* the wound fails or cannot be applied, pressure must be applied *above* the wound; that is, on the side *nearer* to the heart; the course of the blood in the arteries being *from* the heart.

Lacerated wounds are those which are *torn;* as by machinery, or bites of dogs, horses, or other beasts, etc. They are irregular in shape, seldom bleed much, but often inflame, sometimes mortify, and hardly ever heal "by the first intention." *Machinery* injuries may be dreadful in character; a whole limb being torn off at once; or a hand or a foot torn to pieces. Such may be speedily fatal by shock; or their results may entail a tedious and uncertain struggle for life; at least when an arm or a leg is badly lacerated. *Erysipelas* is one of the dangers attending such injuries; *tetanus* (lockjaw), another; *septicæmia* (or *pyœmia*), another.

Besides what may be needful on account of the general shock to the system, lacerated wounds require to be carefully cleared of all fragments of foreign bodies, dirt, etc., and then protected from the air by a proper dressing. To *cleanse* such a wound, a stream of water should be allowed to flow over it from a clean sponge, dipped in warm water and squeezed above the wound. *Water-dressing* agrees well with such injuries. Double a piece of lint or soft linen, and squeeze it out of clean tepid water or clear lime-water. Lay this upon the wound, and cover it with a piece of oiled silk, oiled paper, or thin rubber-cloth. Bandage it on the part with just enough firmness to prevent its being displaced. Such a dressing will have to be moistened at least twice a day, and had better be changed once in twenty-four hours; disturbing the wounded surface each time as little as possible. Before the dressing is reapplied, sprinkle iodoform powder lightly over it. This is antiseptic and promotes healing.

Penetrating wounds may vary much; from piercing with a pin to a bayonet, sword, or bullet wound. Even a needle or large pin may be forced into the heart, so as to cause death. Every one receiving a severe penetrating wound, of any part of the body, must be kept in a condition of complete rest, awaiting results which need to receive the best professional attention, to meet the dangers, seen and unseen, belonging inevitably to such injuries.

Poisoned wounds. These are seldom met with, even in war, amongst civilized nations, except by unintended causation. This may happen especially to physicians and surgeons, in their operations, and to medical students in the dissecting-room. Matter from dead bodies, or from diseased living ones, introduced even into the slightest scratch with a knife, needle, or pin, may so taint the blood as to produce a dangerous illness. Not a few physicians have suffered a fatal result from pricking a finger in a post-mortem examination. To *prevent* such results (besides care to avoid letting an abraded or punctured part come in contact with morbid matters), as soon as such a thing has happened, the part should be immediately *washed* and *sucked*, and then kept out of the way of further danger.

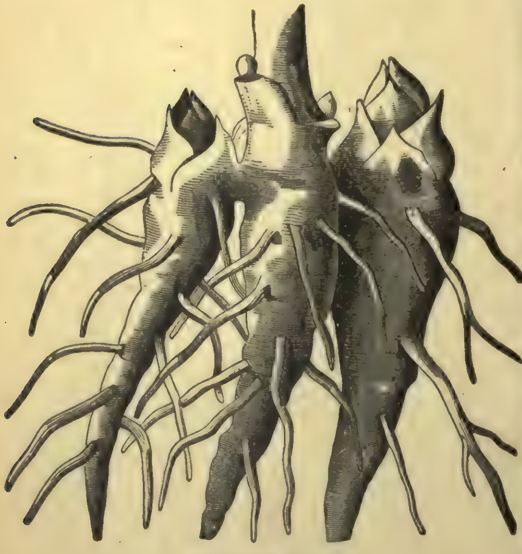
In the *treatment* of poisoned wounds, there is nothing different from that of those which are *penetrating* or *lacerated*, unless the wound is made by *rabid animals* or by *venomous serpents*. For either of these last, *immediate suction* is a right precaution; and at the same time a tight cord around the arm or leg, if either extremity has been bitten; then the end of an iron wire or rod, *heated red hot*, or a piece of *caustic potassa*, should be made to burn out the part; or a pinch of gunpowder may be exploded upon it. All these severe measures are designed to prevent the poison from getting, through the blood-vessels, into the system. Although not more, probably, than one in ten of those bitten by mad dogs have hydrophobia, that one will incurably suffer a dreadful death.

POISONS AND THEIR ANTIDOTES

Poisons are of several kinds: Animal, as snake-venoms and cantharides; Vegetable, as opium, strychnia, tobacco; Mineral, as arsenic and corrosive sublimate. But a more useful classification of them is according to their effects: as Depressants, Irritants, Neurotics, and Complex poisons.

Depressants are prussic (hydrocyanic) acid, tobacco, lobelia, hemlock, and aconite. It is true, the effects of these, and indeed of almost all poisons, have some complexity; but their *chief* effect is depression, sinking, prostration; which, from a certain dose, is fatal.

Irritants are strong acids, as sulphuric, nitric, hydrochloric, oxalic, citric, and tartaric acids; strong alkalies, as potassa, soda, and ammonia; phosphorus; corrosive sublimate; tartar emetic; salts of copper



ACONITE ROOT.

and of zinc; castor-oil seeds; colchicum; croton-oil; cantharides; and certain fishes and molluscs (some mussels, etc.).

Neurotic poisons either produce *stupor*, as do opium, chloroform, ether, chloral, hyoscyamus, and camphor (in excessive doses); or *otherwise* damage the nervous system, with either *delirium*, *convulsions*, *tremor*, or *paralysis*, as strychnia (or nux-vomica), belladonna, stramonium, calabar bean, cocculus Indicus.

Complex (Irritant-Neurotic) poisons are such as arsenic, carbolic acid, creosote, digitalis, ergot, fungi (toadstools, etc.), hellebore, iodine, bromine, lead, etc.

Depressant poisons cause prostration, sinking: with paleness, coldness, feeble pulse, gasping breath, with or without nausea and vomiting; all the symptoms of *collapse*.

Irritant poisons produce burning and pain in the mouth, throat, stomach, and bowels; with nausea, vomiting, and purging; an *artificial cholera-morbus*.

Neurotic poisons have just been described as causing either stupor, delirium, convulsions, tremor, or paralysis. *Complex* poisons may combine several of either of these kinds of effects.

So far, we have been considering poisons as taken into the *stomach* by the mouth. It must be remembered, however, that they may also enter the system by being *breathed* into the lungs; *injected* under the skin; or even *absorbed* from the surface of the skin (especially with children; a tobacco leaf has been so fatally used); or *inserted* into the bowels, etc.

With these general remarks, we may now take up those poisons most likely to be met with, or heard or read about, *alphabetically*, for ease of reference by the reader.

Acids. As already said, strong acids are generally *irritant* poisons. Hydrocyanic or prussic acid is a powerful *depressant*. The *antidotes* for acids are alkalies and alkaline earths; as soda, limewater, chalk, magnesia, and soap, etc. In like manner, acids of the milder sort, as vinegar, lemon-juice, etc., are *antidotes* for poisonous doses of strong alkalies or alkaline earths, as caustic potassa, soda, ammonia, or lime.

Aconite. All parts of this plant (Monkshood, *Aconitum napellus*) are poisonous. The only form in which any one is likely to take it injuriously is that of the *Tincture*

of aconite root, in overdose (the proper dose is one, two, or three drops), or by mistake for something else. Death has been caused in this way: two bottles are standing by a patient's bedside, one containing a medicine to be taken internally, and the other a liniment for external application; an attendant, by mistake, rubs a painful part with the medicine, and gives him a tablespoonful dose of the aconite liniment.

Symptoms: burning, tingling, and numbness of mouth, throat, and stomach, extending afterwards through the whole body; sickness of stomach, dizziness, prostration, sometimes convulsions; no delirium, no stupor, unless in quite exceptional cases. Death, from a sufficient quantity, results in a few hours. Less than a half a teaspoonful of the tincture has proved fatal in some instances; a teaspoonful will always be likely to do so, if left long in the stomach.

Treatment.—There is no chemical antidote for aconite. *Vomiting* should be produced at once to get rid of it. In the household, do not wait to send to a druggist, but give immediately a teaspoonful of *mustard*, mixed in a teacupful of warm (not hot) water. Repeat this in ten minutes, with large draughts of warm water, if vomiting does not follow. If no mustard is at hand, a tablespoonful of salt, in a teacupful of warm, not hot, water, will answer the same purpose. Then mix powdered charcoal, a teaspoonful at a time, in water, and let it be drunk; and also very strong tea, freely taken, Let the limbs be briskly rubbed with warm hands, and place hot bottles or bricks alongside of the body and to the feet. If other treatment is used, it should be only at the judgment of a physician, who should be summoned as soon as possible. This remark will apply to *all* cases of poisoning; and need not therefore be hereafter repeated.

Ammonia.—This is the *volatile alkali*. It has the same chemical relations as the fixed alkalies, potassa, soda, and lithia; but flies off into the air when exposed, requiring, unless dissolved, extreme cold or very good pressure to condense it. It is intensely pungent to the taste and to the breathing organs. and acts as an *irritant poison* when taken in large quantities. Two or three teaspoonfuls, at least, of the stronger solution of ammonia will be necessary to cause danger of a fatal result. Aromatic spirit of ammonia might have such an effect, if a tablespoonful or two were swallowed at once. *Symptoms* of such poisoning are, extreme burning and pain in the stomach, with nausea and vomiting, followed by *collapse* (deathly prostration), which may end fatally in a few hours. One case has been reported in which this took place in a few minutes; another, after three days. Its being breathed freely hastens the effect.

Treatment of poisoning with ammonia is like that for other alkalies. Give vinegar and water, or lemon-juice, quickly and largely. Afterwards, olive oil; then milk; or, if no sweet-oil is at hand, milk alone. The vinegar or lemon-juice combines with and neutralizes the alkaline ammonia. Oil makes a soap with it, which is innocent. Milk will then promote the required soothing action, and will also nourish and support the patient.

Arsenic.—Both by accident and through suicidal or murderous intent, this is one of the most frequently fatal poisons. *Symptoms* of arsenical poisoning are complex. It is an *irritant-neurotic* in its action. About an hour after taking it, there are symptoms of faintness, heat of throat, thirst, and burning pain in the stomach. Violent retching and vomiting follow, and the pain extends through the bowels, with straining and severe purging; sometimes with bloody passages. Prostration soon results; with coldness, small, frequent pulse, and great feeling of weakness; not infrequently delirium, convulsions, or even stupor, will precede death. In slower cases, headache, trembling and other distressing nervous symptoms are common. There is, however, considerable variety in the symptoms of poisoning by arsenic. Death results in most cases within twenty-four hours; exceptiontionally, but rarely, in an hour or less; occasionally, after weeks, or even months of protracted suffering.

Treatment.—If vomiting has not been already copious, give a teaspoonful of mustard or a tablespoonful of salt in a teacupful of warm water; and follow this with large draughts of warm water, in which *magnesia*

has been stirred and mixed. Magnesia is at least a partial antidote for preparations of arsenic. The most effectual antidote is *hydrated peroxide* (sesquioxide) *of iron;* in large doses, in the moist state, and freshly made. This may be prepared by putting *Tincture of chloride of iron* in water (quantity not of very great consequence, use plenty of it), and then adding *aqua ammonia* (solution of ammonia or hartshorn). A thick powder will be thus precipitated;—which, after washing it with clean water, may be given in tablespoonful doses as an antidote for arsenic.

Carbolic Acid.—This is also called *phenol.* It is to coal-oil (petroleum) what creosote is to tar from wood. *Symptoms* of poisoning by either carbolic acid, kerosene, or crude petroleum, are those of an *irritant narcotic.* First there are burning of the mouth, throat, and stomach, pain in the abdomen, vomiting; then great prostration, faintness, coldness; lastly, insensibility and stupor, ending in death. A tablespoonful of the liquid carbolic acid will be pretty sure to cause death, in from half an hour to eight or nine hours. In treatment of this form of poisoning, we must first use an emetic (mustard, salt, or ipecac., with plenty of warm water), and then give the patient large draughts of sweet oil. If that is not on hand, lime-water and milk, freely given, will be likely to do good by shielding the coats of the stomach and bowels from the poison.

Chloral.—*Hydrate of chloral* is the right name of this medicine, which is much used, especially to promote sleep. It is very uncertain in its action upon different people. While some are but little affected by drachm (sixty-grain) doses, others will be considerably narcotized by half as much. Twenty or thirty grains will be an ordinary medicinal dose. Less than a drachm has been fatal in a few instances; *three drachms* would probably almost always kill; although some persons have taken much more with impunity. The *symptoms* of the poisonous action of chloral are merely those of deep narcotism; the victim cannot be roused, and sleeps away to death, in a few hours. *Treatment* of it, in the absence of a certain antidote, consists in the immediate use of an *emetic*, followed by very strong coffee or tea; dashing cold water on the face and chest; if the patient can walk, moving him about, slapping the back and limbs briskly, etc., to keep him awake, as in opium-poisoning; for last resorts, the galvanic battery and artificial respiration. A physician may carefully try the antagonism which probably exists between *strychnine* and chloral.

Chloroform.—This liquid is much used in Europe, but less than ether in this country, as an *anæsthetic*, by being breathed to annul the pain of surgical operations. It is more dangerous, by far, than ether or nitrous oxide, in this mode of employment; and, of course, it should never be taken or given in this way by an unprofessional person. *Symptoms* of chloroform poisoning are those of stupor, from which the patient cannot be roused. This may be preceded by signs of great irritation of the stomach; as chloroform is very pungent and heating when swallowed. *Treatment* requires an *emetic* at once (see Aconite, *Treatment*); and then, as there is no chemical antidote, dashing cold water on the face and chest, and, if it can be obtained, the galvanic battery; as a last resort, artificial respiration.

Copper.—While this metal, when pure, is not itself poisonous, its compounds are; and they are produced by the action on copper of the fluids of the stomach, or by acids and other materials used in cooking, pickling, etc. In this way copper poisoning sometimes occurs, as well as among those working in copper. Mineral water (carbonic acid water, soda-water) dissolves copper; hence reservoirs of that metal, without any, or with only an imperfect, lining of something not soluble, ought not to be used for it. The compounds of copper most often acting poisonously are, *blue vitriol* (bluestone), the *sulphate;* and *verdigris*, the *subacetate* of copper. In large amount taken at once, either of these will cause severe vomiting, pain in the abdomen, and purging; afterwards headache, and, in fatal cases, convulsions or paralysis before death. *Slow* poisoning will result from taking small amounts of copper daily, as in cooked or pickled articles, for a length of time. Symptoms of this are, a coppery taste in the

mouth, with parched tongue and throat; nausea, retching, perhaps vomiting; pains in the stomach and bowels; diarrhœa, with straining; weakness, with nervous restlessness; dizziness, cold sweats, cramps, and at last convulsions.

Treatment for rapid copper poisoning (as it is itself an emetic) should consist in giving an abundance of *whites of eggs;* albumen making a harmless compound with copper. *Milk* may be given freely if no eggs are at hand; its effect is of the same kind. For *slow* copper poisoning, the main thing is to *withdraw the cause*, in whatever thing or things it may exist. Then, a milk diet, with moderate doses of an opiate, as paregoric, or small doses of laudanum, to assuage the pain and diarrhœa, will be suitable.

Corrosive Sublimate.—This, the chloride of mercury, is a deadly poison; three or four grains of it may kill a man. *Symptoms* of its action are, in a marked degree, those of the irritant poisons; a metallic taste, burning in the mouth, throat, and stomach, pain in the abdomen, vomiting, purging, with straining, nervous anxiety, extreme prostration; often convulsions, sometimes stupor, before death. Commonly, death does not result under one or more days; but examples are recorded of its taking place within an hour after the poison had been swallowed. *Treatment* of corrosive sublimate poisoning requires (as for copper) free administration of whites of eggs; the more the better, until relief is obtained; or, if eggs cannot be had, large and repeated draughts of milk.

Fungi.—*Mushrooms* and *Truffles* belong to this group of plants; both being largely eaten, and agreeing with most persons. Botanists inform us that there are many species of innocent and nourishing fungi; but there are some, also, that are dangerously poisonous. While, then, the *general rule* is, that those whose color is not dark, nor taste harsh, nor odor disagreeable, are harmless, *experiments* are not safe in such a matter, when made by those ignorant of the kind they have found. The true *eatable mushroom*, *agaricus campestris*, grows on open ground, has *pink* "gills" or frilled arrangement underneath its crown, a small "ruffle" also on its stem, and a thin skin on top, which can be peeled off easily. The assertion made by some that even this plant is unsafe until cooked does not agree with my experience; as I have often eaten at least a small handful of mushroom plants raw, without any injury. Still, they may under some circumstances be less wholesome, and cooking improves their flavor as well as secures their innocency. *Symptoms* of "toadstool" poisoning are those of irritant poisoning; vomiting, purging, and abdominal pains; with, also, dizziness, partial blindness, delirium, perhaps convulsions and stupor, at least in fatal cases. Generally, the symptoms do not show themselves for a number of hours, if the *irritant* effects are most prominent; but *stupefying* effects have sometimes appeared within an hour or two.

No *antidote* for fungus-poisoning having been ascertained to exist, the proper *treatment* for it is, the use of mustard, salt, or ipecac. as an *emetic*, followed by charcoal and magnesia-water, and then stimulants (ammonia, whiskey, etc.), if required by great debility; lime-water and milk for nourishment (later, beef-tea, etc.); and, if irritation and pain without stupor be present, careful use of moderate doses of some opiate, as paregoric or laudanum, to assuage distress and procure relief.

Lead.—While metallic lead is not poisonous, many of its compounds are so. The one most nearly inert is the sulphate of lead. Hence sulphuric acid, and its salts, as sulphate of magnesium, are antidotes for it. Sugar of lead (acetate of lead) and the subacetate, present in Goulard's extract, which are often used to make lead-water, are sometimes taken poisonously by mistake. Violent vomiting and purging, with very severe pains in the abdomen, followed by prostration have been the symptoms in such cases; death taking place (if the quantity was very large) in from one to three days. *Treatment* for such *acute* or sudden poisoning by lead, should consist in the use, if vomiting is not copious, of an emetic dose (twenty to thirty grains) of sulphate of zinc, followed by whites of eggs in abundance, milk, and moderate doses of sulphate of magnesium (Epsom salts); with warmth applied to the

body, and opiates (as paregoric or laudanum) to relieve pain when the most urgent symptoms have been overcome.

Opium.—*Symptoms* of any kind of opiate poisoning are: in not very excessive dose, at first a short period of excitement; in overwhelming dose, this is absent and the deep stupor comes almost at once; with closed eyes, whose pupils, if the lids be raised, are seen to be contracted; pulse slow and full; breathing snoring (stertorous); face flushed and skin warm, until near the end, when pallor and coldness precede death. The slowness of the breathing in bad cases is very remarkable. The condition on the whole bears a close resemblance to *apoplexy*, *dead drunkenness*, and *compression of the brain* from fracture of the skull. In neither of these, however, are the pupils contracted as in opium-poisoning. Death usually follows within from seven to twelve hours.

Treatment of opium-poisoning calls first for an *emetic;* a teaspoonful of mustard, a tablespoonful of salt, or a teaspoonful of ipecac., in warm water, should be poured down the throat at once, if the patient can swallow. When this is not possible, a physician will use a *stomach-pump*. Also, cold water should be dashed upon the face, and the patient's body may be slapped vigorously, or, if he can, he may be made to walk about; anything to *keep him awake*, or from sinking into the fatal degree of lethargy.

Phosphorus.—This substance, a small portion of which is always naturally present in our brains and in our bones, is, when in the separate state, a most destructive poison. It acts rapidly; when, for example, ends of lucifer matches are swallowed, through mistake or malice. It is known also to act slowly, in producing disease of the jawbones, with those engaged in making lucifer matches. *Symptoms* of acute or rapid phosphorus poisoning usually begin to appear a few hours after it is taken. There is a garlickly taste, with burning in the throat, pain in the stomach, violent vomiting, sometimes purging; coldness, prostration, and either convulsions or stupor before death, which may follow in from one to five or six days. The amount necessary to kill an adult is less than a grain. A child two years old is reported to have died in consequence of swallowing the ends of eight friction-matches; and two of these have killed an infant two months old.

Treatment of phosphorus poisoning must be conducted without any known antidote, unless old *spirit of turpentine*, in teaspoonful doses, be such, as some have asserted. First give an *emetic* with plenty of warm water; then *charcoal and magnesia-water*, abundantly. No *oil* (unless oil of turpentine, as above said) is to be given after phosphorus poisoning; oil dissolves and diffuses it more rapidly. Rice-water, milk, or flaxseed-tea will be suitable to allay irritation, in a case which escapes death.

Infancy and Childhood.

Nourishment.—Every mother should, if she can, nourish her own child, from her own breast. This is nature's law, as well as the law of love.

Some mothers, unfortunately, *cannot* furnish nourishment for their offspring. Either they have no milk, or very little, so little that a child cannot live on it; or they are in such feeble health that it will risk *their* lives to afford it; or indisposition may make their milk unfit, unsafe for nourishment. What then?

The usual resort is to the *bottle*. First, however, ascertain whether the mother has not *some* good milk, even though not enough. If she has *half* enough (as is the case with quite a number) let her give the babe the benefit of this, if it lasts, until the child has passed through the most of its teething, or at least has weathered its first summer. Let her nurse it two or three times in the day and evening, and give it (or have given to it) the bottle for the rest of the time.

Indeed, it is a good plan, under all circumstances, for a child six months old to *learn* to use bottle-food, so as to make the change more easy later, especially if illness or some other cause should oblige the mother to wean it suddenly.

Weaning.—This never should be sudden, if it can be helped. If a mother can nurse her infant a full year, it will be well; if eighteen months, still better. When she has, up to two years, half enough for it, let it get what it can from her, and eke out the

rest with outside nourishment. Never let a child be weaned in *summer* if it can be helped.

Bottle-feeding.—The bottle is vastly better than the spoon. It imitates nature better; it allows the food to go more slowly into the stomach; and it gives the infant desirable exercise in taking it. Get a glass bottle, holding about half a pint, with a rubber nipple, but without a tube. Two bottles, or at least two nipples, will be well to have, for alternate use and thorough cleansing of both. For a babe less than a month old, half a bottle at once will do for a meal. In a few months, it will readily take nearly or quite a whole one, several times a day. A child six months old can, and ought to, appropriate three pints of milk or more in twenty-four hours. Remember a child has to grow as well as to live. When too much has been swallowed, it will often (and had better) be *thrown up*. If it be milk, this is then usually *curdled*. Untaught persons are frightened at this; but the fact is that milk is *always* curdled at the beginning of digestion. The natural acid of the stomach acts upon it.

After each time of use, the bottle ought to be *scalded* (that is, washed out with hot water); in summer time, or where the child is delicate, an added precaution is to add soda to the water with which it is cleansed.

Milk.—Cow's milk is almost the only kind used in this country for infants; here and there, goat's milk may be had. Cow's milk is *stronger* in "solid" contents than woman's milk, but the latter is sweeter. Commonly, then, during the first months, a little pure water is added (half, or less, of the amount of milk), and a little white sugar. As the child grows older, less water is needed, and within the year often, none at all. A great mistake was formerly made, in mixing two pints of water with every pint of milk; the poor things sometimes, no doubt, starved under such a regimen.

But, sometimes, the *thicker* and *harder* curds made in the stomach with cow's milk may be difficult for the babe to digest. It becomes colicky and fretful, or it refuses the bottle. Then we must add rather more water, and something else to help to diffuse the clots, thus keeping them from forming solid masses.

Starchy materials will do this pretty well. Such *alone* will not nourish a child fully; arrowroot, farina, and other starches contain *no nitrogen*, and some of this element is indispensable for the growth of muscles, bones, and brains. Moreover, during the first three or four months very little saliva or pancreatic juice is formed, and, without these, starch is not digested. But the *mechanical* qualities of starch fit it for mixing up the casein and albumen of milk in the fluids of the stomach, and so promoting its digestion.

What May be Used with Milk.—Simple articles, especially barley, rice, and oatmeal, are commonly available for this purpose. Either of them does best when ground (or beaten in a mortar) to a fine powder for use. *Barley*-water answers well when the bowels are about right (that is, from two to four *moderate*, *natural* passages daily); *rice*, when there is diarrhœa; *oatmeal*, when the child is "bound," or not free enough in the bowels.

For barley-water, a teaspoonful of barley-meal for a two or a three months' old infant, two teaspoonfuls for one over six months, may be mixed with a tablespoonful or two of cold water, and then put into a pint of water. Bring this to the boiling-point, and *boil it down* to half a pint. Strain it through a fine sieve or a clean linen cloth, and stir it in with a pint of milk, adding a little salt, and an even teaspoonful of granulated white sugar. Put what is not used at once, in a cold place (on ice, if it be summer time, or in the spring-house in the country) to keep for the next feeding-time. Never give milk twenty-four hours old to a young child, under any circumstances.

Rice and oatmeal may be prepared in the same way, and used according to the state of the child's bowels, *when milk alone does not appear to digest well*. Should neither of these simple additions meet the difficulty, you may safely try some of the "infants' foods." Mellin's, Horlick's, Nestle's, and Imperial Granum are, among the best. These "foods" are not, like arrow-root, sago, and tapioca, merely *starches*. They contain some also of the *nitrogenous* materials.

It is not necessary, indeed it is hardly desirable, to ask a dairyman to furnish only the milk from one cow. You must know the cow very well to be sure that its milk is the best. A *good dairyman* is the best dependence of all; and there is no harm in mixing the milk of several cows, all equally fresh. What ought not to be done is to mix *two days*' milks together. Thorough scouring of the pans, and keeping milk in a pure atmosphere (as well as a cool one), are of extreme importance.

When milk is served only once a day in hot weather, it had better be brought at once to the boiling point—to make it keep better,—and then set in the coolest and cleanest part of the house; best of all, put on ice.

A young infant, under a year old, had better take all its food *warm;* unless in the torrid heat of our midsummer. With the thermometer from 95° to 98°, one does not, young or old, want anything warm, inside or out.

If there be a sour smell on the breath, or sourness of the curds thrown up, or colicky pain after feeding, or beginning looseness of the bowels, *lime-water* should be added to the bottle-food. A tablespoonful to the bottle will not be too much. It is always harmless, if the bowels are not constipated; and it often does a great deal of good. When *very* tough curds are formed after taking cow's milk, a pinch of *soda* (bicarbonate) will help to dissolve them still more effectually than lime-water or the starch foods. But soda must be used in *small* doses, and *occasionally* only. Lime-water may be, if called for, an every day remedy for sourness of stomach, especially with a disposition towards diarrhœa.

For *thirst*, between feeding-times, in summer weather, the best plan is to give cold water moderately, and supply from time to time a soft clean rag containing pounded ice for the child to suck. When a sick child has fever, however, it may often need to drink a good deal of water.

Clothing for Infants.

Let the clothing of infants, from birth, be warm enough and loose enough for comfort. No tight bands should ever be put on them. Some parents, in over-anxiety about cold, put on three times as much as is needed, and then shut all their chamber and nursery windows and doors, with big, hot fires; wondering, then, that their babies are fretful, get skin diseases all over, and often seem to catch cold almost every time they are taken out.

Babies resist actual cold less safely than older persons; but just *enough* clothing is always better than too much for them. And they do not need to have the rooms they live in any warmer than we do—say 68° to 70° Fahr. usually. They are also more hurt by close, foul air than grown people are.

When they are old enough to wear short clothes, a common mistake has been of an opposite kind: to leave their arms and legs bare; they are so pretty thus! But many an attack of croup and of inflammation of the lungs, sometimes fatal, has followed such exposure in a chilly atmosphere. Children should have no less protection of their limbs from cold than men and women. Even though, when healthy and active, they do not seem to feel it; it is not safe.

Very important is the *changing* of clothes with infants. When their thighs are wet, and all next to them is soiled, they should be changed *at once*, always. Neglect of this may cause chafing of the skin, very disturbing to the child, and sometimes as bad as a burn. A soft sponge is, when the skin is tender, better than a rag or towel; but a sponge must be *well cleansed* every time, with soap and hot water, to be used again. Dusting with a little "pat" filled with fine starch or arrow-root powder is very soothing and protective.

When the skin has become sore about the thighs, the child will show it by a sharp cry on wetting itself. Redness also, as well as tenderness to the touch, will be found on examining it. Then *tallow*, *cold cream* (of the apothecary), or *oxide of zinc ointment*, should be applied gently every night and morning (or oftener if need be) after changing it. The worst cases, such as come only from considerable neglect, may need to be treated like burns, with soft rags, wet with lime-water and sweet oil (equal parts, mixed), and covered with oiled silk.

Babies, as well as adults, should have the head kept cool, and the feet warm. Out of doors, a cap is all right—thick or light according to the season; but there is no need of any cap being worn in the house. They are better without it.

A frequent trouble is with the bed-covers at night. First, never forget that covering *makes no warmth* of itself, It only keeps (by non-conduction) what warmth the body has of its own. So, if a baby is put cold into a cold bed, especially if it be sick, it may scarcely get warm all night. In that case the bed-clothing should be warmed first; by passing a hot flat-iron under and over it; or, for an ill baby, keeping a warm brick or bottle or tin of hot water in the bed while needed.

Restless children will often fling and kick the bed-covers all off at night; and this exposes them to taking cold. Watching them all night is hard service. Much better will be the canton-flannel night-gown, sewn up tight (like mittens) at the ends of the hands and feet. If they do throw everything else off, this will keep them still pretty warm.

Must infants always wear flannels in the daytime? Delicate ones certainly should, in our climate; thick (though soft) flannel in winter, and light flannel in summer time. When an infant shows itself, at two or three years of age, to be hardy, its summer flannel may be left off safely. *Silk*, or merino, will do for all but weakly children.

Bathing.—A new-born child should be bathed only in *warm* water, in a warm room. From 95° to 90° should be the temperature of its bath; the thermometer had better be used, as the touch is so uncertain. As it gets older, at least if it seems "hearty," the water may be allowed gradually to go down to 85°; or, in warm weather, even 80°. The best test of its not being too cool, is, the infant being rosy and merry after the bath. A child should like its bath, if it is rightly managed; never startling it with a sudden plunge, but accustoming it to it by degrees. A mother had better bathe her own baby, if she is well and strong enough to do so.

One error especially to be avoided is, letting a child, once wet all over, sit *half in* and *half out* of the water; being thus chilled by evaporation from the uncovered part of the body.

During our *hottest* weather, when the thermometer ranges between 94° and 100°, even a young infant may profit by a cool bath, say at 75° or 70°; but then it must be a *short-time* bath also. The cooler, the shorter the time of immersion.

Much soap does not need to be used in bathing infants. If the child be bathed daily, it needs (after its *first* thorough cleansing) only an occasional employment, unless about the thighs, of a little of the best castile soap. *Salt* may be added to the bath if the child is weakly, for its tonic effect. In *sickness*, *warm* or *hot* baths may be of great service.

Exercise.—After the first few months, a babe should be allowed and encouraged to *sprawl;* first on a wide bed, being watched that it does not fall off; afterwards on a carpeted floor, or a rug. This will spread its chest, and bring most of its muscles into play. Thus it will gain strength, and get ready, in due time (*don't hurry it*) to stand up and walk. Crawling comes first, according to the true nature of bodily development,

Airing.—*Very soon* every baby ought to begin to be taken out in fine weather. In summer, no matter how soon; in winter, it requires care about keeping it warm, of course. But quite young infants may be, with proper out-of-door clothing, accustomed to being taken out into the sunshine and air every fine day.

A nusery ought to be always a *sunny* and *well-aired* room. As already said, infants suffer more harm from bad air than grown people do. Scarlet fever, measles, whooping-cough, diphtheria, and all other diseases are commonly worst, killing the most children, in tenement-houses; and, elsewhere, in crowded alleys, where people live too close together and do not have fresh, pure air to breathe.

Sleep for Children.

For the first month or two, an infant naturally sleeps more than half its time. All through the first year, many babies sleep from twelve to sixteen hours in the

twenty-four. It is a grand thing for all concerned when the little one can be trained early to sleep *most of the night*. Habit may be formed, in such matters, very soon.

Lay the child down to sleep, from the start; do not get it used to being carried about to go to sleep in somebody's arms. Put it to sleep in its crib, alone as a rule. Hard to believe as it seems, some weary slumbrous mothers have *overlain* their babies; that is, rolled upon them while asleep and suffocated them. Moreover, the vapors from another human body make the bed less wholesome for the child. Yet, with a *wide* bed, convenience may sometimes afford reason for a child being laid beside, but not too near, its mother or nurse.

Never rock a child in a cradle. This has, happily, quite gone out of fashion. If it has any effect, it is by causing a kind of a dizziness (like seasickness) which cannot be good for the child.

Let the baby soon get used to going to sleep in the dark. Otherwise, when it gets older, it will be afraid to do so, with a fear often very hard to overcome. Put *no curtains* about a bed, for a child or grown person.

Most babies, when they do sleep well early in the night, wake very early in the morning, and then want food. Before noon they are apt to be ready to take a nap of two or three hours. Some will also want an afternoon nap of an hour or two. Let them sleep all they will; sleep and grow fat. Never wake a young child (or indeed an older one) suddenly; it jars their brains. When their sleep is out they will wake up of themselves.

Teething.

Mothers and nurses ought to know what to look for in their babies' mouths, as the months follow each other in their first two years. Only twenty teeth, be it remembered, come in the first set, or, "milk teeth." Thirty-two follow these, and take their place, in the second set.

About the end of the sixth month (from the fifth to the eighth), it is common for the two *lower middle front* to appear through the gum; and not long after, even sometimes before these, the two *upper middle* front ones. These are called *cutting* or incisor teeth. So are the next to come out—alonside of the first—the lateral incisors (side cutting teeth), below and above; which appear between the eighth and the tenth months. Before the infant is a year old, then, it usually has at least *eight front teeth* out; four below and four above.

Next, we might expect those nearest these to appear; but they do not. Instead come the *first jaw* or molar teeth—two below and two above—between the twelfth and the fourteenth months.

Then follow, between the fourteenth and twentieth months, the stomach and eye teeth, as people call them; the four canine teeth, two below and two above; pointed teeth.

After these, and last of the first set, come the *second jaw* or molar teeth; two below and two above; between the eighteenth and the thirty-sixth months. In each jaw, in all, there are then four incisors, two canines, and four molar teeth; doubling these, we get the twenty of the whole set. The following diagram shows this, with the order of their succession:

5	3	4	2	1	1	2	4	3	5
M	M	C	I	I	I	I	C	M	M
M	M	C	I	I	I	I	C	M	M
5	3	4	2	1	1	2	4	3	5

I stands for *incisor;* C for *canine;* M for *molar*.

This order is the *general* mode of succession; but variations from it are far from rare. Often the upper teeth, front and all, come before the lower ones. The time for each group of teeth is frequently later, and sometimes earlier, than that above mentioned.

As the time comes near (about the sixth or seventh year) for the second dentition, the new set, whose germs were in the jaws at birth, grow steadily larger in the gums. The milk teeth are *not forced* out; but, under the wonderful natural adaptation of parts, their fangs are gradually absorbed, and thus they loosen and drop out, or are easily taken out, and make way for the second set of permanent teeth. These are

thirty-two in number. The first to come through the gums are the first molar or jaw teeth. Next, at about seven years of age, the middle incisors; then the lateral incisors, at or near the end of the eighth year. After these, the first pre-molars (bicuspids) or lesser jaw teeth; and in the ninth year, the second pre-molars. Between eleven and twelve years, the permanent canines, two above and two below. From twelve to thirteen or fourteen years, the second molars; and from seventeen to twenty-one years, the last molars, or *wisdom teeth*. These last are often imperfect from the start.

Dentition is a process of *growth*. A great deal of blood is needed in the tissues of the jaws for this purpose. Moreover, for the teeth to "come out," the gums must give way, by absorption. Should this be slow, a *tension* of the gum may occur; and, through the nerves, the whole system may be brought into sympathetic excitement. As the nervous apparatus is much more irritable, more easily disturbed, in babyhood than in adult life—we often have, from this cause, worrying; fretfulness; sometimes fits, or *convulsions*. A child which was "always good" before, now may cry a great deal, losing its reputation for goodness altogether.

Why Babies Cry.

A word here about babies' crying. A *healthy* child, not teething, *if well taken care of, will very seldom cry*. If it becomes very hungry, and is not nourished, or is cold, or too warm, or is left with garments soiled and wet, *of course* it cries. And, the habit once formed, cry it will, though the whole household and neighborhood regard it as a "crying evil."

Several sorts of crying may be observed, which it is desirable to understand. First there is the cry of surprise, on the child being first ushered into the world. That is all right and natural.

Next, comes the *calling* cry, of hunger, thirst, or other *want*. Sharper and shriller, sometimes a violent *scream*, is the cry of *pain;* as of colic or earache; or of fright, as when a babe rolls out of its bed or crib upon the floor. Much like the cry of simple want, but habitually harsher in manner, is that of *demand* or *command*, of a child already *spoiled;* finding that *whatever it cries for it will get*. An aggravation only of this, is the (sometimes fairly impish) roar and succession of screams, of *temper* and *passion* *Disease* has various cries; according to its character. Sometimes it is only a faint moan, attending nearly every breath. Other times it is hoarse, as in croup; along with a short, barking cough. Or it may be the wild scream of inflammation of the brain.

What Teething Is.

Teething is not a disease, a morbid process, at all. But it is an important change, which for the time renders the child more than before or after *liable* to disorders, under any disturbing causes; and the process of penetration of the gums by the young teeth *may* sometimes itself be imperfectly accomplished. The most common and least alarming effect of the "sympathetic irritation" of teething is *diarrhœa*. This seems often to give a *safe vent* and relief to the disturbance of the system. Three or four, or even five passages from the bowels daily, at such times, are not objectionable; are much better than constipation. *Convulsions* are frightful to behold, and attended by danger.

Here, however, it may be suitable to refer briefly to *lancing the gums*. Healthy babies may often pass through their teething without needing to have their gums lanced. But some may be, by this simple and harmless means, kept from having convulsions, which, if brought on, may threaten their lives. Use a *clean*, sharp lancet, and divide the gum with a straight, firm cut; in the direction of the edge if it be an incisor, and across the crown if a molar tooth; and then there will never be any "scars" or other trouble.

It is well to lance the gums whenever they are much *swollen*, *red*, painful, and *worrying*, to the child, making it nervous and hard to get to sleep; or when, even though not swollen, the tooth is evidently not far within the gum, which seems tense, and a source of irritation, calling for relief. Many a child, once helped by this measure, will ask for it, with looks if it has no words, to have it repeated.

A lesser, but not unimportant means of relief for worriment of the mouth during teething, is the use of rubber rings, bits of ivory, etc., smooth and firm, but too large to swallow, for the child to bite upon. When there is much heat of the mouth, a soft rag filled with pounded ice will, in summer time, do the most good.

At no time is it more needful than during dentition, to be very careful about the *food* which the child takes. Indigestion is a very common exciting cause of convulsions.

Summer Dangers.

In our American cities, hot weather kills more young children than any other cause. Look at the weekly record of deaths in New York or Philadelphia, and you will find that every degree of noon temperature above 95° costs scores if not hundreds of little lives. In those cities, about one-half of the deaths of children in the first year of life, and nearly one-third of those in the second year, take place in June, July, and August.

High heat, *crowding*, *filth*, and *unsuitable food*, conspire against children in the summer homes of the city poor. But the rich may suffer also, from *excessive heat*, *town air*, and *improper diet*, for their children; and these causes produce many cases of *summer complaint*, or "cholera infantum."

Whoever, of our city families, can take their infants out into the country, during their first, second and third summers, for the months of June, July, August, and September, ought to do it. With those who cannot, the next best thing is to take or send them out on frequent excursions, on land or water, and to have them often in the open parks or squares; for as much *pure*, *cool* air as they can get. It is the best preventive, and often the best curative, of summer complaint.

For those who are obliged to live in the crowded parts of towns or villages, the rules given by the Obstetrical Society of Philadelphia "for the management of infants during the hot season" have proved serviceable. I will quote them here, in addition to what has been already said on our previous pages on the same subjects.

Rules for Management of Infants.

Rule 1.—Bathe the child once a day in tepid water. If it is feeble, sponge it all over once a day with tepid water, or with tepid water and vinegar. The health of a child depends much upon its cleanliness.

Rule 2.—Avoid all tight bandaging. Make the clothing light and cool, and so loose that the child may have free play for its limbs. At night, undress it, sponge it, and put on a slip. In the morning remove the slip and dress the child in clean clothes. If this cannot be afforded, thoroughly air the day-clothing by hanging it up during the night. Use clean diapers, and change them often. Never dry a soiled one in the nursery or in the sitting-room, and never use one for a second time without first washing it.

Rule 3.—The child should sleep by itself in a cot or cradle. It should be put to bed at regular hours, and be early taught to go to sleep without being nursed in the arms. Without the advice of a physician, never give it any *spirits*, *cordials*, *carminatives*, *soothing-syrups*, *or sleeping-drops*. *Thousands of children die every year from the use of these poisons.* If the child frets and does not sleep, it is either hungry or ill. If ill, it needs a physician. Never quiet it by candy or cake; they are the common causes of diarrhœa and other troubles.

Rule 4.—Give the child plenty of fresh air. In the cool of the morning and evening send it out to the shady sides of broad streets, to the public squares, or to the park. Make frequent excursions on the rivers. Whenever it seems to suffer from the heat, let it drink freely of ice-water. Keep it out of the room in which washing or cooking is going on. It is excessive heat that destroys the lives of young infants.

Rule 5.—Keep your house sweet and clean, cool and well aired, In very hot weather let the windows be open day and night. Do your cooking in the yard, in a shed, in the garret, or in an upper room. Whitewash the walls every spring, and see that the cellar is clear of all rubbish. Let no slops collect to poison the air. Correct all foul smells by pouring carbolic acid or

quicklime into the sinks and privies. The former articles can be got from the nearest druggist, who will give the needful directions for its use. Make every effort yourself, and urge your neighbors, to keep the gutters of your street or court clean.

Rules for Diet of Infants.

Rule 6.—Breast-milk is the only proper food for infants. If the supply is ample, and the child thrives on it, no other kind of food should be given while the hot weather lasts. If the mother has not enough, she must not wean the child, but give it, besides the breast, goat's or cow's milk, as prepared under Rule 8. Nurse the child once in two or three hours during the day, and as seldom as possible during the night. Always remove the child from the breast as soon as it has fallen asleep. Avoid giving the breast when you are over-fatigued or overheated.

Rule 7.—If, unfortunately, the child must be brought up by hand, it should be fed on a milk-diet alone, and that, warm milk out of a nursing-bottle, as directed under Rule 8. Goat's milk is the best, and next to it, cow's milk. If the child thrives on this diet, *no other kind of food whatever should be given while the hot weather lasts.* At all seasons of the year, but especially in summer, there is no safe substitute for milk to an infant that has not cut its front teeth. *Sago, arrow-root, potatoes, corn-flour, crackers. bread, every patented food, and every article of diet containing starch, cannot and must not be depended on as food for very young infants.* Creeping or walking children must not be allowed to pick up unwholesome food.

Rule 8.—Each bottleful of milk should be sweetened by a small lump of loaf-sugar, or by half a teaspoonful of crushed sugar. If the milk is known to be pure, it may have one-fourth part of hot water added to it; but, if it is not known to be pure, no water need be added. When the heat of the weather is great, the milk may be given quite cold. Be sure that the milk is unskimmed; have it as fresh as possible, and brought very early in the morning; Before using the pans into which it is to be poured, always scald them with boiling suds. In very hot weather, boil the milk as soon as it comes, and at once put away the vessels holding it in the coolest place in the house—upon ice if it can be afforded, or down a well. Milk carelessly allowed to stand in a warm room soon spoils, and becomes unfit for food.

Rule 9.—If the milk should disagree, a tablespoonful of lime-water may be added to each bottleful. Whenever pure milk cannot be got, try the condensed milk, which often answers admirably. It is sold by all the leading druggists and grocers, and may be prepared by adding, without sugar, one teaspoonful, or more, according to the age of the child, to six tablespoonfuls of boiling water. Should this disagree, a teaspoonful of arrow-root, of sago, or of corn-starch to the pint of milk may be cautiously tried. If milk in any shape cannot be digested, try, for a few days, pure cream diluted with three-fourths or three-fifths of water—returning to the milk as soon as possible.

Weaning the Infant.

Rule 10.—The nursing-bottle must be kept perfectly clean; otherwise the milk will turn sour, and the child will be made ill. After each meal it should be emptied, rinsed out, taken apart, and the tube, cork, nipple, and bottle be placed in clean water, or in water to which a little soda has been added. It is a good plan to have two nursing-bottles, and to use them by turns.

Rule 11.—Do not wean the child just before or during the hot weather, nor, as a rule, until after its second summer. If suckling disagrees with the mother, she must not wean the child, but feed it in part out of a nursing-bottle, on such food as has been directed. However small the supply of breast-milk, provided it agrees with the child, the mother should carefully keep it up against sickness: it alone will often save the life of a child when everything else fails. When the child is over six months old, the mother may save her strength by giving it one or two meals a day of stale bread and milk, which should be pressed through a sieve and put into a nursing-bottle. When from eight months to a year old, it may have also one meal a day of the yolk of a fresh and rare-boiled egg, or one of beef- or mutton-broth into which stale bread has been

crumbled. When older than this, it can have a little meat finely minced; but even then milk should be its principal food, and not such food as grown people eat.

When an infant's bowels do not act, at least once or twice, freely, every day, *sweet* (olive) *oil* may be given, a teaspoonful at once; or *manna*, a quarter of a teaspooful at a time (it is sweet and easily taken); or *simple syrup of rhubarb*, a teaspoonful at once; or *glycerine*, a teaspoonful at a time. If the stomach is sick at the same time, *magnesia* may do more good, a quarter or half a teaspoonful, according to the age of the child, stirred well up in a little water. If colic is present, *castor oil*, a teaspoonful mixed with two teaspoonfuls of *spiced syrup of rhubarb* wil be the best thing to open the bowels.

THE LAWS OF HYGIENE

How to Keep Well.

In the pages over which we have passed, our effort has been, as the reader will perceive, to describe the various ailments with which man is afflicted and the accidents or injuries to which he is liable; also, the remedies to be applied or the methods to be adopted in the treatment of the sick or the injured. This, while a great part of the story, is not the whole story. There is a further very important phase of the subject. It is one thing to know how to get well; it is another to know how to keep well. There is a science of health as well as a science of sickness. The former we call hygiene. This deals with the rules to be observed to enable us to avoid ill-health. These are of the highest importance, and it is incumbent upon us here to give the leading laws and principles of hygiene science.

The world we dwell in is full of the seeds of disease. They come to us in the food we eat, the water we drink, the air we breathe. We cannot stir abroad or confine ourselves at home without exposing ourselves to some unwholesome condition. The germs of disease lurk everywhere. We may escape them in part, but cannot altogether. But what effect they will have upon us depends largely upon ourselves. A sound, vigorous constitution and healthy normal condition of the organs of the body, enable us to expose ourselves, with impunity to conditions which might prove fatal to those of feeble powers of resistance or weakness in some of the vital organs. Therefore, in addition to care in avoiding exposure to injurious influences, it is very important to strengthen our powers of resistance by a reasonable amount of exercise, the breathing of fresh air, attention to suitable clothing, heedfulness of any organic weakness, and everything adapted to give us strength and powers of endurance.

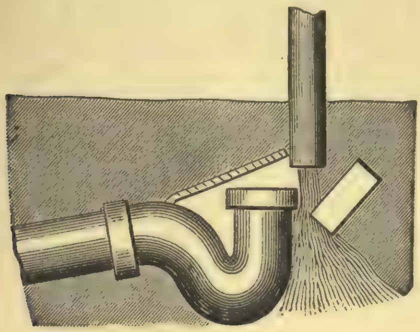
Impure Air.

The air which we breathe is rarely quite pure, and is often very impure. This is especially the case in city life and within our houses. Pure air is only to be found in the open country, the mountains, or at the sea-side. In addition to its normal oxygen and nitrogen, many other gases make their way into it, some of them, being very unhealthful. There are also solid particles of "dust," of a great variety of materials, animal, vegetable, or mineral, many of them more or less harmful. The worst of them are the floating bacteria, living germs of disease, which inhabit air and water alike; the great majority of these are harmless, some of them are deadly in their effects.

Of the impure gases in the air, some of the worst are of our own production. We are constantly breathing out matter which is poisonous to the system if breathed in again. This is largely carbon dioxide (or carbonic acid gas), with small quantities of organic poisons, the waste of the system.

We can easily understand how it is that pure air becomes poisoned by respiration, the specially dangerous products being the carbon dioxide and the organic matters. The total amount of carbon dioxide breathed out in an hour is about 6 cubic feet. While this is an injurious gas, it is probable that

the bad effects of breathing respired air are more due to the poisonous organic matter, as it is found that while an artificial atmosphere containing 1 part of carbon dioxide



MISPLACED PIPE.

in 100 of air causes but little discomfort when breathed, yet if an already respired air containing only 1 part of carbon dioxide in 1,000 of air is breathed much discomfort is experienced. This organic poison is probably composed partly of an organic vapor from the lungs, and partly of solid matter from the lining of the mouth and air passages. It is difficult to find out the exact quantity of organic matter present, but it varies exactly in proportion to the quantity of carbon dioxide, and the amount of this in respired air is therefore taken as the standard of impurity.

The Air from Sewage and Sewers.—This is found to contain a great diminution of the oxygen, a large increase of the carbon dioxide, and many other gases, such as sulphureted hydrogen, sulphide of ammonium, marsh-gas, etc. A more harmful constituent is found in the numerous germs present, which are probably thrown into the air of the sewer by the bursting of bubbles on the surface of the putrefying sewage.

The air from churchyards contains carbon dioxide in excessive amount, various vapors of ammonia, offensive and putrid gases, and many germs.

Air polluted by Trades.—These impurities depend, of course, on the nature of the trade. We may have hydrochloric acid, sulphur dioxide, sulphurous acid, ammonia, and sulphureted hydrogen from chemical works; carbon dioxide and monoxide and sulphureted hydrogen from brickfields; nauseous organic vapors from glue refining, bone burning, fat boiling, candle making, and slaughter houses; and various vegetable and mineral impurities from near works where cotton, linen, flint, or iron particles are thrown into the atmosphere. Nor must we forget the air of workrooms polluted by various products of manufacture, such as lead, phosphorous, flax, etc.

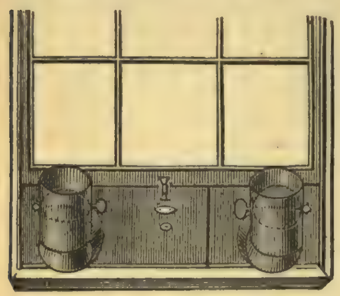
The air of towns must necessarily be very impure, owing to the presence of the injurious products given off by combustion, respiration, sewers, and trades; we find a lessened amount of oxygen, an increased amount of carbon dioxide, and a fairly large amount of solid matter, both inorganic and organic. It is also found that it is especially in the narrow streets of crowded parts of the town that the atmosphere is particularly foul. In the open spaces and wide streets the impurities are not nearly so great.

In close rooms the air is made impure by products of combustion (as from the burning of gas) and by respiration; the impurities thus caused may be very great, even to the extent of 3 parts of carbon dioxide in 1,000 of air. In a room in Leicester, containing six persons, with only 51 cubic feet of air space each, and with three gas-lights burning, the amount of carbon dioxide was found to be over 5 parts per 1,000 of air.

Diseases Due to Impure Air.

Respiration.—The effect upon most people of breathing over-respired air is to cause heaviness, sleepiness, headache, giddiness, fainting, and sometimes vomiting. When the air is still more impure death may result, as in the case of the 146 prisoners kept in the Black Hole of Calcutta, for a single night, of whom 123 died; and also when 150 passengers were shut up on a very stormy night in a small cabin of the steamer *Londonderry*, of whom seventy died before morning. The breathing of impure air day after day causes people to become pale, lose their spirits, strength and appetite, and, as a result, they easily contract any infectious disease which is in the district; and this

remark especially applies to consumption, which is particularly common in communities, who live in bad impure air, and the frequency of which tends to diminish in proportion as the air habitually breathed is improved.



A GOOD VENTILATOR FOR A ROOM.

Combustion.—The solid particles of carbon from the smoke of fires, and the fumes of burning sulphur, are harmful to the respiratory apparatus. The gaseous products, such as carbon dioxide and carbon monoxide, may cause death if present in large quantities, and even in small quantities cause pallor, headache, heaviness, and oppression.

Sewer Gas.—If an atmosphere is very largely contaminated with sewer gas, death may occasionally result. In smaller quantities this form of impurity will cause sleepiness, headache, loss of appetite, vomiting, diarrhœa, colic, and prostration. Diarrhœa, typhoid fever, and almost certainly diphtheria are not uncommonly set up by sewer gas getting into houses, but at present there is no certain proof that scarlatina can be caused in this way. The air coming from rivers polluted with sewage, or from land on which sewage has been thrown, has been known to cause dyspepsia, and even dysentery.

Other Causes.—The air from marshy or newly-broken ground is apt to produce ague. Workmen exposed to the dust arising from various occupations are liable to lung disease. Lead poisoning not unfrequently occurs from lead dust from dyed goods; wool sorters occasionally get a fatal disease called anthrax from germs coming from the wool of animals which have been similarly affected, and various other diseases arise from the unhealthy air of work-rooms.

Diseases Due to Impure Water.

Water is another fertile source of disease, many organic and inorganic impurities making their way into it. It is to the former that its unhealthfulness is generally due. Nearly all water from the earth contains some mineral ingredients, few of which are harmful, some of which are healthful. The waters of many mineral springs serve as remedies for serious disorders of the system. The chief source of water pollution lies in organic impurities, which are carried through the soil from cesspools, manure heaps, and similar sources into wells, or are emptied by sewers into the rivers from which many cities now derive their drinking water.

The lack of sufficient water may also be a cause of disease. The person and clothes are not properly washed, houses and streets are dirty, and the sewers become clogged with filth. As a result there is a general lower state of health of the community, and typhoid fever and diarrhœa may be prevalent.

Vegetable Impurities.—Peaty water, in the absence of a better supply, may be used without much harm, but if the amount of solid matter is great it may even produce diarrhœa. Under this head we must include water containing germs, for although they generally get into the water from the excretions of animals, yet, as we know, they are vegetable in nature. Here we shall meet with the most dangerous kinds of water, causing many fatal epidemics.

Cholera.—Chief among these is cholera, whose germs are now thought to be conveyed only by water. The great epidemic at Hamburg in 1892, was traced to sewage water from cholera patients getting into the river Elbe, which supplies the city with water. The constant outbreaks of cholera which occur amongst the Mecca pilgrims every year are due to the fact that they wash in and drink out of the same wells, thus leading to an enormous mortality. This frequently, perhaps almost wholly, comes from a like distribution of the bacterial germs of the disease by water. Typhoid fever has been traced to this cause in numerous instances. This was the case at Over Darwen in 1874, when a drain containing the excreta of a typhoid patient was blocked, and its contents got in the main pipe of the water supply. As a result, out of a population of 22,000 there were 2,035 cases of

typhoid fever and 104 deaths. In Bangor, in 1882, there occurred an epidemic of typhoid fever, affecting 540 persons out of a population of 10,000, of whom 42 died. This was found to be caused by the excreta

HOW PEOPLE DRINK SEWAGE.

of a single typhoid patient getting into a small stream which discharged into the river supplying the town with water.

Diphtheria is probably conveyed and caused by impure water, but this is not yet absolutely proved. Dysentery is well known in tropical countries to be caused by impure water, as was proved by an outbreak at Cape Coast Castle, where it was caused by the passage of sewage into one of the drinking tanks. Diarrhœa has been caused in epidemic form by impure water, as was shown in the old Salford jail, where the untrapped overflow pipe from a cistern of drinking water communicated with a sewer, and the water had thus absorbed sewer gas, and probably germs.

Mineral Impurities.—A moderate degree of hardness is not harmful, but if the hardness is great dyspepsia and constipation may result. Goitre seems to be due to the presence of magnesium limestone in the drinking water, but this is disputed by some. Iron salts cause dyspepsia, constipation, and headache. Lead salts are especially dangerous, causing colic, paralysis, kidney disease, and sometimes death. These symptoms may occur when the amount of lead does not exceed one-tenth grain per gallon.

Purification of Water.

Fortunately, it is comparatively easy to destroy the injurious organic impurities of water and render it wholesome for drinking purposes. This, it is true, demands a degree of care and precaution which many will not take; and as a result of ignorance and heedlessness, water is almost everywhere a common carrier of disease. The peril of injury from it can be overcome in a measure by the use of domestic filters, composed of charcoal or other substances. These, however, are much more effective in removing the mineral ingredients than the more dangerous organic particles. They also are rarely kept pure and clean, and may become simply breeding places for bacteria.

Boiling.—The only safe way of purifying questionable water in households is by boiling. The disease germs, which can endure unharmed the low temperature of liquid air, are destroyed by boiling water. To make sure, the boiling should be kept up at least ten minutes. An unpleasant effect of this is that it gives the water a flat taste from its loss of air. Some means should be adopted to restore to it the lost air. This may be done in a measure by subsequent filtering, the water slowly trickling down through and absorbing the air.

City Filters.—Of late years many cities have introduced filters on an extensive scale, to purify the total supply and thus cut off this prolific cause of disease at its source. The principal means employed for this are large filter-beds of sand and gravel, though in some cities spongy iron is used with good effect. The result has been highly encouraging in the prevention of epidemic diseases, and filter-beds are likely to be introduced before many years into the water-supply of all our larger cities.

Diseases Due to Food,

Food may in various ways give rise to disease. Over-eating is one source of injury to the system. Part of the food is not absorbed, and may become putrid in the intes-

tines, causing dyspepsia, constipation, or diarrhœa. If the excess consumed is principally in the nitrogenous materials, it leads to an increase of the chemical changes in the body, and the person tends to become thin rather than the contrary. It may cause gouty conditions and disease of the kidneys and blood-vessels. Excess of starchy and sugary foods often causes acidity and flatulence and great fattiness of the body, as is also the case with excess of fatty food.

Deficiency of Food produces gradual loss of flesh and weakness of all the bodily organs, particularly of the heart. The body is, moreover, little able to resist cold and various diseases, and thus half-starved people are easily attacked by fevers and consumption.

Bad Proportion of Food Stuffs.—If food is not given in about the right proportions, various dyspeptic troubles may arise, and the body will not be properly nourished. Similarly, eating food in a hurry, bad cooking of food, and a bad arrangement of meals, the food being taken too often or too seldom, or too much taken at one time and too little at another, will lead to stomach troubles.

Scurvy.—One of the best-known diseases caused by the absence of some essential of a diet is called scurvy. This used to be very common on board ships on long voyages, and was caused either by the great use of salt beef, or (much more probably) by the absence of fresh vegetables containing the necessary vegetable acids. Nowadays fresh meat can be more easily taken on long voyages, and potatoes and lime-juice are freely given, so that sea scurvy is practically unknown. In large towns, however, we very frequently see the same disease, as shown by the sore and bleeding gums and the appearance of blood under the skin like small bruises, and the condition is only found in badly-fed people, who will tell you that they live almost entirely on bread and butter and tea, with meat occasionally, and fresh vegetables sometimes on Sunday. This land scurvy soon disappears when proper food is given.

Rickets is a disease found in young children, and is very largely due to feeding with improper food (such as starchy materials,), and to an absence of fresh air. The child perspires chiefly about the head at night, and the whole body seems to be tender and sore, the ends of the bones becoming soft and enlarged, especially near the ankles and wrists, and deformities of the limbs, such as bow legs or knock knees, may result. If there is any sign of this disease beginning, the child must not on any account be allowed to walk for many months, and he should be given plenty of fresh air, sunlight, and good nourishing food.

Diseases Due to Food Eaten when it has Become Putrid.—It is a curious fact which we cannot explain that some food, such as ripe cheese, game, and "high" mutton is only eaten in a state of decomposition, and yet no evil results follow. Apart from these examples, we know that putrid food ought to be absolutely avoided, as it may cause intense poisoning, with vomiting, diarrhœa, great collapse, and even death. Such cases are, unfortunately, not uncommon from the eating of putrid meat pies, hams, and sausages.

Food Diseased in Itself.—Diseased animals not unfrequently communicate their diseases to man. Thus so called "measly" cattle and pigs contain in the flesh or muscles innumerable small bladders, which are living animals of a low type. When these are taken into the intestines of man without being killed by thorough cooking they begin to grow, and form tape-worms. Another disease, found often in Germany, Russia, and Sweden, is trichinosis, which is caused by eating pork either raw or not properly cooked. Minute worms live in the muscles of the pig, and these, on getting into the intestines of man, begin to breed in enormous numbers; the young worms then pierce the intestines, get into the blood-vessels and into the muscles, so causing diarrhœa, fever, pains in the muscles, and even death.

Certain diseases in cattle ought certainly to prevent them being used as food; these are infectious inflammation of the lungs of cattle, cattle plague, and consumption in the cow, smallpox in the sheep, and trichinosis and swine fever in the pig. The milk also of cows affected with foot and

Mouth disease sometimes causes severe symptoms with very sore mouth and lips, and, rarely, sore hands in children, and it is almost certain that the milk of tubercular (consumptive) cattle will cause consumption in the human being.

Vegetable foods, if putrid and decayed, may cause severe illness, just as may happen with putrid animal food.

Good Food conveying Germs.—This is most frequent in the case of milk, where it has been found that whole districts supplied by one milk farm have been affected with some disease, such as typhoid fever, diphtheria, or scarlet fever, and inquiries have shown that either at the farm or in the milk shop germs of these diseases have got into the milk, either from the air, from sewer gas, or more often from water taken from an impure source, and either added to the milk as an adulteration, or used for washing out the milk cans. These diseases carried by milk, as well as tuberculosis from the milk of tuberculous cows, can be entirely prevented by boiling the milk for at least five minutes before it is used.

Alcohol and Tobacco.—Alcohol is not required by the body, and, as a rule, to which there are few exceptions, people are much better and healthier without it; for instance, it has been repeatedly proved that soldiers can bear the hard labor of war very much better when no alcohol is given to them. In large and repeated quantities it causes many diseases, such as gout, diseases of the liver, heart, brain, and nerves. When taken, it should never be between meals, but only with food; it should never be given to children except when ordered by a doctor, and should never be taken by those who have insanity or drunkenness in their families. In the treatment of disease it is a most useful drug, but here again only to be used by a doctor's order.

Tobacco-smoking is a habit which should never be indulged in by any one under twenty-one years of age. Even after that age it is merely a luxury, and not a necessity, and if practiced in excess it may cause pain and irregularity of the heart, sore throat, dyspepsia, and partial blindness.

Infectious Diseases.

Diseases which may be communicated from one person to another, or from an animal to a man, are known as infectious diseases. Some of these, such as itch, lice, ringworm, hydrophobia, and a few others, require actual contact with a diseased person or animal, and so are called contagious diseases. Some of the other infectious diseases, though actually transmitted in a different way, may also be conveyed by touch.

Animal Parasites.—The commonest attacking the external parts, such as fleas, bugs, lice, and mosquitoes, are generally well known. They cause much irritation, with small lumps on the skin, and scratching leaves many marks on the body. The itch insect is very minute and microscopic, but as the female burrows under the skin and lays her eggs, small papules and pustules form, with very great irritation, and the body may be almost covered with an unsightly eruption. This disease can be communicated by touch to others. The head louse attacks the hair, and may be seen crawling about, or its eggs or "nits" can be seen fixed on to the hairs themselves. It causes much irritation, eruptions on the head, and lumps at the back of the neck.

Some insects are also of injury as conveyers of germ diseases. For instance, it is now known that the germs of malaria and yellow-fever are largely, if not solely, carried by mosquitoes. Flies also carry some diseases from one person to another, especially *ophthalmia*.

The animal parasites attacking the internal parts of the body are numerous. The commonest are tape-worms which get into the body with diseased meat of the cow or pig, and cause much irritation from their presence in the small intestine; the common round worm, about twelve inches long, which also lives in the small intestine; and thread or seat worms in the lower part of the large intestine, causing great discomfort. Very rarely in this country the trichina gets into the intestines and muscles of man from diseased pork. It is not easily killed or expelled if it has once got into the body. The other worms mentioned may be easily expelled by simple medicines, and any discomfort

which they may have caused is thus removed. Another internal animal parasite, which is fortunately not very common, is the "bladder" form of the tape-worm of the dog. This bladder may begin to grow in some organ (generally the liver) of the human body, and cause great suffering, and even death, from its large size. It can only be removed effectually by a surgical operation.

Vegetable Parasites.—These are all very minute, and only visible by the microscope, and their presence on or in the body is only judged from the diseases which they set up. They attack either the external or internal parts of the body. They may be all included under the one head of germs or micro-organisms. These are small, generally microscopic organisms of the lowest forms of vegetable life.

How Germs are Conveyed and Received.—Germs may be carried from one person to another, and received by that person in different ways. They may be conveyed by actual contact, as in the case of ringworm, erysipelas, ophthalmia (infectious inflammation of the eyes), hydrophobia, small-pox, etc. The germs may possibly be taken in through the unbroken skin, but much more frequently through a small crack or sore in the skin. Secondly, they may be conveyed by the air, and taken in by the breath. This is by far the commonest method, as seen in whooping-cough, scarlatina, small-pox, diphtheria, measles, consumption, etc. Thirdly, they may be carried by water, and so taken into the stomach and intestines, as with cholera, typhoid fever, dysentery, etc. Fourthly, by the food, and taken to the stomach and intestines as before, as with typhoid fever, consumption, and foot-and-mouth disease (conveyed by milk). Fifthly, they may be carried by clothes, and so get into the air, as with scarlatina. They may also be carried by insects, such as flies and mosquitoes, as above stated. In some instances the method of conveyance is mysterious, as in the widely-prevalent influenza, whose history has so far baffled research.

Why Children Should not be Purposely Exposed to Infectious Fevers.—It is the custom with some ignorant mothers to purposely expose their children to mild cases of fever, especially measles, chicken-pox, and scarlatina, because they say the children are certain to get them at some time or another, and in this way they think their children will have mild attacks which will protect them in the future. Such a practice is almost criminal, and should be absolutely condemned, and for the following reasons: It is *not* certain that a child will have fever at some time or another; if proper precautions were taken it would not have an infectious disease. A mild attack in one person is not always followed by a mild attack in another, but may give rise to a very serious one. One attack of fever does not necessarily prevent a second attack of the same fever at some future time. The death-rate in children suffering from most fevers (such as measles or scarlatina) is always greater than in adults. Finally, as a rule, the older a child grows the less likely is it to be attacked by a particular fever.

Disinfectants.—This word should only be used to indicate some process or chemical agent which will absolutely kill germs and spores. It is, however, unfortunately applied to other classes, the antiseptics, which will only stop the growth of the germs, but will not kill them; and the deodorants, which merely remove disagreeable smells, and often have no action whatever on the germs themselves. It is obvious that we must use a true disinfectant if we wish to prevent the spread of disease.

Deodorants are such substances as the vapors of turpentine, burning peat, or boiling tar; such liquids as Condy's fluid, or various odorous fluids such as eucalyptus; and such solids as charcoal or camphor. Most of these take away unpleasant smells, but are otherwise useless.

Antiseptics include such bodies as borax, boracic acid, chloride of lime, thymol, Condy's fluid, and various patent disinfectants (so-called). These will arrest the growth of germs, and so prevent putrefacfaction, but few of them will absolutely kill germs. Condy's fluid will, of course, do so, but only when used in such a strong solution that it would discolor and destroy any clothes put into it.

True disinfectants are of three kinds: fumigation, heat, and chemical.

Fumigation by chlorine and sulphurous acid gas. It is probable that many spores will resist this method, and germs hidden, say in the pocket of a coat, will escape destruction.

Heat.—This is the best method of disinfection as, if the temperature is sufficiently high, all germs and their spores will be destroyed. Unfortunately, it cannot be applied in the case of all infected articles. A ready method of heat-disinfection which can be used in every household is, where possible, to boil any infected article, as it has been shown that by boiling for ten minutes all germs and spores are destroyed.

Chemical Disinfectants. — Although there are many so-called disinfectants offered for sale, yet only a few are true disinfectants if used in a strength which will not destroy the articles to be disinfected. Of these we shall only mention two, namely, carbolic acid and corrosive sublimate. Both of these are dangerous poisons, and must be handled with the utmost care. Carbolic acid needs to be diluted in the proportion of 1 part acid to 20 parts water. Corrosive sublimate is sold in the form of tablets, colored blue to avoid accidents. These must be dissolved in water in the proportion of 1 part to 1,000.

Contagious Diseases.

The following points will help to determine the nature of a suspicious illness:

Disease	Rash or Eruption	Appearance	Duration in Days	Remarks
Chicken-pox . . .	Small rose pimples changing to vesicles	2d day of fever or after 24 hours illness . .	6–7	Scabs from about fourth day of fever.
Erysipelas	Diffuse redness and swelling	2d or 3d day of illness.		
Measles	Small red dots like flea bites	4th day of fever or after 72 hours' illness	6–10	Rash fades on 7th day.
Scarlet Fever . .	Bright scarlet, diffused	2d day of fever or after 24 hours' illness . .	8–10	Rash fades on 5th day.
Small-pox	Small red pimples changing to vesicles, then pustules . . .	3d day of fever or after 48 hours' illness . .	14–21	Scabs form 9th or 10th day, fall off about 14th.
Typhoid Fever . .	Rose-colored spots scattered	11th to 14th day . . .	22–30	Accompanied by diarrhœa.

It will often relieve a mother's anxiety to know how long there is danger of infection after a child has been exposed to a contagious disease. The following table gives the information concerning the more important diseases:

Disease	Symptoms Appear	Period Ranges from	Patient is Infectious
Chicken-pox	On 14th day	10 to 18 days	Until all scabs have fallen off.
Diphtheria	" 2d day	2 to 5 days	14 d's after disappearance of membrane.
Measles*	" 14th day	10 to 14 days	Until scaling and cough have ceased.
Mumps	" 19th day	16 to 24 days	14 days from commencement.
Rotheln	" 14th day	12 to 20 days	10 to 14 days from commencement.
Scarlet Fever	" 4th day	1 to 7 days	Until all scaling has ceased.
Small-pox	" 12th day	1 to 14 days	Until all scabs have fallen off.
Typhoid Fever	" 21st day	1 to 28 days	Until diarrhœa ceases.
Whooping Cough†	" 14th day	7 to 14 days	Six weeks from beginning to whoop.

* In measles the patient is infectious three days before the eruption appears.

† In whooping-cough the patient is infectious during the primary cough, which may be three weeks before the whooping begins.

How to Avoid Disease.

There are various ways in which disease may be avoided. One is not to expose ourselves to contagion or injurious influences. We need to be careful of the food we eat, the water we drink, even the air we breathe, for all of these, as above shown, are prolific sources of the germs of disease. We must also keep away from those afflicted with contagious diseases, or, if obliged to enter their presence, take precautions to avoid infection.

This danger is now taken in hand by the health authorities of cities, patients of this character being removed to special hospitals, or, if kept at home, the yellow placard of warning is conspicuously displayed. Only physicians and nurses—who are supposed to know how to take care of themselves—are permitted to enter the sick-room, or even the house in cases of this kind.

A second and highly important method of avoiding disease, whether infectious or from organic weakness, is to strengthen the system by dint of suitable exercises; seek to breathe only fresh and pure air, adapting the clothing to the climate and the bodily needs, and in other ways endeavoring to harden the body and to enable it to defy the insidious assaults of disease.

Muscular Exercise.

Exercise of all parts of the body is an absolute necessity for the maintenance of perfect health. If a steam-engine is allowed to stand idle it will soon rust and get out of order. Similarly, if the body has no work to do, it will become too fat, and the muscles will waste and get flabby, the heart will become weak, the circulation slow and feeble, the blood will not be properly aerated, poisonous products will accumulate in the body, the complexion will be pale, and the intellect dull, and if the brain is not regularly exercised the person will merely develop into a muscular animal, no better than a savage; he will be stupid, ignorant, and uninteresting both to himself and to others.

The effect of regular muscular exercise is to expand the lungs, to increase the amount of oxygen taken in and the carbon dioxide breathed out; the sweat is increased; and so exercise helps to get rid of waste matters from the body. The heart is strengthened, the blood is more aerated, the muscles grow larger, harder, and more active, the appetite and digestive powers increase, the body is kept warm, and the brain is more active and bright as a result of the general health being so good. During exercise more food is required and much pure air.

The brain worker should take regular gymnastic exercise in a well-ventilated gymnasium, or, better still, regular outdoor exercise, such as walking, climbing, swimming, cricket, or lawn tennis. It is very necessary that such exercise should be regular, as if done irregularly or in "spurts" it will do more harm than good, because the muscles, not being in training, will soon get tired, and the body will suffer. The person whose occupation is an entirely muscular one, such as the common laborer or the blacksmith, should spend his spare time in reading, music, and other mental studies. In other words, every man should have a "hobby" which should exercise faculties as differeut as possible from the usual occupation. There is but little danger in hard and continuous work, provided it is varied and not monotonous; it is not work but worry which kills. The tendency to worry when there is no need, and which is such a prominent feature with some people, should be constantly kept down.

The above remarks as regards exercise apply, of course, not only to men but to women, and to them almost with greater force, as women neglect it to such an extent. There are plenty of forms of perfectly womanly exercise which may be taken, such as walking, rowing, swimming, skating, and lawn tennis, and if these were indulged in regularly we should hear less of hysteria and weak backs.

The conditions necessary for keeping the muscles in good order are those required for the healthy nutrition of every organ of the body; namely:

Good, rich blood; distribution of blood, and of nerve-force, without obstruction, to each part; exercise of the organs, according

to their ability; sufficient intervals of repose.

Everybody knows that we must have sleep for several hours in each twenty-four, or we wear out. Besides sleep, however, which affects the brain only, there must be rest from action in all the muscles.

The heart must, first of all, be protected from disturbance. It naturally beats faster when any of the large muscles are working actively, as when we run or walk fast; especially up stairs. Our breathing is then hurried also; and thus, commonly, a check is put upon our doing too much: we "get out of breath," and have to stop or slacken our movement.

When the heart is overworked, one of two things happens. If the body is at the time well nourished, and its general vitality is good, the heart *grows stronger*, just as other muscles do, with exercise. In time it grows thicker also; and this is the "hypertrophy" of medical books. But, if the overwork is incessant, the blood is thin and poor, and the sum of energy in the body is low, the heart becomes weak instead; its muscular fibres become pale and thin. In this condition they are easily stretched by the blood within the heart's cavities, and we have what doctors call "dilatation of the heart."

Tight lacing does mischief and impairs health, sometimes causing sudden death, by cramping the motion of the heart, as well as the expansion of the lungs in breathing. It is an enormous mistake; all the more intolerable because the wasp-like shape which it gives to the female figure is unlovely as well as unnatural. No sculptor of classic Greece, no painter of Italy, in the days of Raphael, Michael Angelo, and Titian, ever gave to a goddess or a Madonna such a form as modern fashion has sometimes tortured its victims to obtain. Happily, there is, of late years, some gain in fashion in regard to this matter; the direction both of good taste and of hygiene.

Modes of Exercise.

Walking is excellent; unsurpassed in benefit to the system if one can afford time to get enough of it; a pleasant country, moderate weather, and good company being almost essential to its advantages. Beginners must not walk too fast or too far. Stop at the end of the first hour, and sit down for five minutes. Rest ten minutes at the end of the second, and every successive hour, if you go on long; and never, while unaccustomed to pedestrianism, go more than three miles in one hour.

Riding on horseback is an admirable exercise; but it leaves neglected a number of useful muscles, which are brought into action in walking. Farmers in some places ride on horseback almost always, if they have to go a mile or more; and, in consequence, they become poor walkers. They often almost wear out in an hour's stroll over hard pavements in town. Bicycling much resembles riding in effect.

Rowing is a capital exercise. More muscles are used in it than in walking or riding on horseback; hands, arms, back, legs, and feet are all strenghened by it.

Skating is as wholesome in itself as any exercise can be. Always in a cold, bracing atmosphere (except *roller* skating, of course, which may be anywhere), even in a "rink," with freedom and variety of movement of the body and limbs, yet without violence, it is excellent for both sexes.

Swimming, as an *exercise*, apart from the good obtained from bathing, is less favorable. The pressure of the water, and its temperature if cool or cold, force the blood more or less from the surface of the body to the head. Swimming rapidly is, also, a violent exercise. But every boy and girl should learn to swim as early in life as possible, so as to lessen the danger when "overboard" unexpectedly anywhere.

Out-of door games, as lawn tennis, croquet, cricket, base-ball, are all, in moderation, not only enjoyable, but wholesome in their effect upon the bodily condition. Exhilaration of mind makes all exercise more beneficial. It is astonishing what an amount of work people will do under the name of play. A Chinese mandarin, on seeing a number of English gentlemen engaged actively in a game of base-ball or cricket said, "In my country we always *pay* people for taking so much trouble to amuse us." No

treadmill, however, would ever build up muscle like the cricket ground.

Healthy Breathing.—Little thought is needed, for every one to see that for good breathing there must be sound lungs and air-tubes, and strength in the muscles of the chest, as well as pure air. Our breathing muscles can be strengthened by exercise. *All* active muscular movements of any part of the body, but especially brisk walking or running, quicken the action of the heart; and, as the blood then goes more rapidly through the lungs, it needs to be, and is, aired by quicker breathing.

Using the *voice* a great deal (as in speaking or singing) in early life, promotes the growth of the lungs and the strength of the breathing muscles. Those who belong to consumptive families should, while young, be accustomed to active out-of-door habits; and for them, reading or speaking aloud or singing (vocal gymnastics) will be wholesome exercise; that is, so long as they are well. When the lungs are actually diseased, active efforts of all kinds should be avoided.

Pure air, and *plenty of it*, is a constant necessity for health. The application of this truth belongs in many ways to our every-day life, especially, of course, within doors. Out of doors we can usually trust to nature to supply us a fair share of wholesome air, if, of course, we keep away from localities in which the air is vitiated by bad sanitation or other unwholesome surroundings.

Personal Cleanliness.—The importance of cleanliness in all the actions of life is almost too apparent to need mention, were it not that it is so much neglected by many. Not only cleanliness of the skin, the hair, the teeth, the nails, and the clothing is necessary, but also cleanliness in all our habits. By this means we shall avoid many diseases which are entirely due to dirt of various kinds. The old and excellent definition that dirt is matter in the wrong place suggests that it should be removed; and when we remember that this dirt may consist of irritating particles of minerals in the form of dust, or of poisonous chemicals, and, more fatally, of disease germs, we shall be greatly impressed with the necessity of being clean.

Clothing.

Clothing, to promote health, should be: sufficient for comfortable warmth; not excessive in quantity or pressure; properly distributed over the body; suited to permit transpiration and moisture; changed often enough for cleanliness.

Some persons, with the idea of *hardening* themselves, wear as little clothing in winter as possible. This is perhaps well enough if they are very robust; but if not strong, they become chilled through and may be severely reduced in health.

Yet it is equally a mistake to keep one's self too warm, burdening the body with unnecessary clothing. The same is true of bed-covering, in respect to which people have very different needs. On the same night one may be satisfied with a single blanket, while another needs two or three. Every one ought to be warm enough to sleep comfortably.

Kind of Clothing.—We should adapt the amount and quality of our clothing to the weather. Not by the almanac, however, as the seasons do not follow it exactly. Chinese people, it is said, having cool nights and very hot noons, begin the day with several light garments on. As the hours of morning bring warmth, off goes one thing after another, till by noon-day they have only one or two covers left. With the cooling of the afternoon they again begin to put them on; and so, hour by hour, they get back to the morning's raiment. This is reasonable enough. Many persons among us make the mistake of wearing too little clothing (as well as keeping their houses too cool) in the changeable and uncertain weather of spring and autumn; and a large number of "colds" are caught in that way.

Of the materials in use for clothing, the warmest (besides furs) is wool. An open, porous fabric, containing air, conducts heat more slowly than a smooth, dense one; because air itself is a slow heat-conductor. So a tight-fitting kid glove scarcely keeps the hand warm, while a loose mitten is very comfortable in cold weather.

Silk is a slow conductor also, and it is warm for garments in proportion to its thickness. It conducts *electricity* very slowly,

which makes it particularly suitable for undergarments with those who are liable to pains and aches on damp days, or when the wind is "easterly."

Next to wool and silk comes cotton (muslin); and the coolest of all are linen garments. These are most fit for midsummer wear, when our American climate is, by fits and starts at least, tropical. Every one should be prepared, however, at all seasons with *extras* to put on in case of change of weather from warm to cool.

In our variable climate, delicate persons, especially those liable to rheumatism or neuralgia, generally find advantage in wearing either *light* flannel or silk next to the body even through the summer, with a heavier kind, of course, for winter.

In the distribution of clothing over the body, the main part to keep warm is the chest. As it contains the heart and lungs, all the blood in the body passes through it constantly, and conveys its temperature everywhere. Moreover, chilling the heart or lungs endangers injury to those central organs themselves.

Next, the abdomen must be sufficiently protected. Great organs, the stomach, bowels, liver, spleen, kidneys, etc,, are contained in it, and are all (most of all the bowels) liable to attacks of disorder from cold. Sudden changes of temperature often bring on diarrhœa; sometimes, cholera-morbus or dysentery.

Then, the extremities. Of these, the feet must be best cared for. They are farthest from the heart, and nearest to the ground. Hence, at the same general temperature, they suffer most from cold. Children, in mild climates, may grow up accustomed to running about barefoot, if they have freedom and space to acquire active habits.

Night Attire.—At bedtime all the clothes should be changed, the day clothes being hung up to be dried and ventilated. The night clothes should be made of cotton, which is not irritating to the skin as woolen is. Sufficient warmth will be given by the bedclothes, which should consist in part of blankets or feathers, and should be light and warm. A woollen night-dress, besides being irritating, promotes too much perspiration, and makes the body hot; but for young children, old people, rheumatic subjects, or in very cold climates, a woolen night-dress is necessary.

How to Live Long.

As a brief summary statement of the most essential conditions of health and longevity, we may conclude our study of Hygiene with the following precepts:

1. Never breathe three breaths of foul air when you can get out from it into that which is fresh, or can get fresh air into the place where you are.

2. Eat when you are hungry, and only wholesome food. Eat slowly, and stop as soon as hunger is satisfied.

3. Drink pure water when you are thirsty; take milk as part of your daily food; a cup of tea, not too strong, if you like it, or cocoa; but coffee only when you are very tired; and alcoholic beverages, while in good health and strength, never. Also, make no use of tobacco.

4. Dress always with a view to comfort and convenience; not compressing the chest, nor impeding the movement of any of the limbs.

5. Be careful to maintain a regular habit of daily movement of the bowels.

6. Rest, if you can, when tired, and sleep when sleepy. Take eight hours of sleep every night; more, if you feel the need of it, and can get it.

7. Work regularly at something every day, and do the best you can throughout; but avoid over-work. The sign of it is, that you wake up tired, not refreshed, in the morning.

8. Never do any regular week-day labor (simple unavoidable small chores excepted) on the first day of the week. Make it a day of repose and renovation for mind and body.

9. However rich you may be, do not make pleasure the aim and object of life; it will wear you out faster than work, or even worry.

Lastly, let every day be cheered by sunshine from above, and brightened by the hope of a better life to come.

VALUE OF VEGETABLE AND ANIMAL FOOD

No subject is of more vital importance to the care of health than that of food. Hence a knowledge of the value of various food products is indispensable to housekeepers and to those who value their own health.

Are *vegetarians* right, who insist that we should eat no meat at all? Their argument is, that vegetables contain all the elements required for our nourishment, made up into organic stuff, ready to be digested and built up into our tissues and used as fuel. Hence, they say, it is useless, cruel, and expensive to slay our subject animals to gratify our carnivorous taste.

True, plants, roots, seeds, and fruits do contain everything absolutely necessary for food. Men often live for years, many perhaps (after infancy) for lifetimes, without animal food. But that is not the whole question. Is a solely vegetable diet the *best* for *health* with *all people?*

On this we must inquire further; are the elements in exactly the *same state of combination* in vegetables as in meat? Our answer is, no. They are more *concentrated* in animal flesh, are worked up already into animal substances, and therefore are more *readily assimilated* than vegetable food.

Can we judge by anything in our *structure* which we are best fitted for? Flesh-eating beasts, as lions, cats, dogs, have *only* sharp, cutting, and tearing teeth. Grass-eaters have nippers in front, and all the back teeth broad-crowned, nearly flat. We resemble the bear, hog, and rat, in having teeth for cutting in front, tearing at the sides, and broad, grinders back in our jaws.

The length of the human alimentary canal (that is, stomach and intestines) is about six times that of our bodies; intermediate between that of the purely *carnivorous* and of the entirely *herbivorous* animals. It would seem then that, like the bear, hog, and rat, we are made fit for *either* animal or vegetable food. We are *omnivorous*.

On the whole, this is the conclusion to which physicians and sanitarians have generally come—that, with healthy people, living in the open country, not working very hard, and having an abundance of good vegetable food, meat is not necessary. They can live long lives without it. But, in close-built cities, where the air is not pure, where work is hard, and "vexation of spirit" abounds, a *mixed diet is best*.

Bread.

Time out of mind "the staff of life," was made of *brayed* grain by our ancient forefathers before they left Western Asia. Bread contains nitrogenous and non-nitrogenous food principles; gluten and starch, as well as salts. It is adapted both for tissue-building and for energy-producing use in the body.

Wheat bread is as strong in nitrogen as any, and is richer than other kinds in phosphates, which are supposed to be in part nerve-feeders. The *whitest* of flour does not make the most nourishing bread. The richest part of the grain is just beneath the chaff, making slightly yellowish flour. Improved ways of grinding wheat now retain nearly all of this strength of the flour, some of which was formerly wasted.

Rye meal makes, by itself, a nourishing but less spongy bread than wheat. It is very largely eaten by people in Northern Europe. The best way to use it in making bread is to mix it with an equal or less quantity of wheat flour.

Bread must be properly *raised* to be good. This is done by a *fermentation*, which takes place in the starch (it first becoming changed to sugar) of the dough, under the action of yeast. Sugar, when it ferments, is converted into *alcohol* and *carbonic-acid gas*. The alcohol is very small in amount. The carbonic acid gas is kept in by the sticky, pasty *gluten*, of which good flour has about twelve per cent. Thus the dough is stretched or expanded into a spongy mass. *Baking* dries it somewhat, and makes it more or less crisp, or at least takes away the adhesiveness of the dough.

Faults of bread, which make it less wholesome, as well as less agreeable, are *heaviness*, *sourness*, *bitterness*, *mouldiness*, and an excess of *saline* material. Heavy, ill-raised, and under-baked bread is very

unwholesome. Sour bread is so also. It is made by *over*-raising, or by using spoiled flour. Bitterness comes either from bad yeast or too much of the yeast being used; mouldiness, from the flour or bread being kept too long.

Other ways of raising bread are: using *salæratus*, bicarbonate of potassium, from which the carbonic acid is set free by warmth, or by adding sour milk, containing lactic acid; or putting in the dough sour milk and bicarbonate of sodium; or carbonate of ammonium (smelling salt); or phosphoric acid and bicarbonate of sodium (Horsford's process). Still another plan is to make the carbonic acid as it is made for "mineral water," and then by pressure to force it into the dough. This constitutes "unfermented aerated bread." When carefully made, it is very good, keeps well, and can safely take the place of ordinary bread.

Hot fresh bread has a somewhat more adhesive or pasty quality than stale bread. The gastric juice, therefore, does not so readily penetrate and digest it. Persons with entirely sound digestion have no trouble in disposing of it; but dyspeptics should always prefer stale bread.

Adulterations of flour are most often alum, chalk, lime, and potato meal. A little alum is frequently put in by bakers to whiten the bread, as well as to make it weigh more when sold by the pound. Much alum makes it unwholesome, irritating the stomach and binding the bowels. Potato meal is harmless, but a fraud when mixed with wheat flour, as it costs much less, and is not so nourishing. The microscope will detect it.

Bran bread (as before remarked) is rougher than that of white flour, and so, by stimulating the muscular coat of the bowels, it helps to keep them open. Rye bread is about as nourishing as wheat. Oatmeal does not rise so well as wheat flour, but in cakes, porridge, gruel, and grits, it makes an admirable food.

Buckwheat is nourishing, but proves to be rather better suited, in buckwheat cakes, for an occasional luxury than for a stand-by diet. Barley is not a strong meal, though "John Barleycorn" makes a very strong drink when fermented and distilled. Barley water is often a good addition to milk when it disagrees with young infants.

Rice contains but a moderate amount of nitrogen, but plenty of starch, and (like other grains) some salts; and it is very easily digested. Chinamen and Hindus, many millions of them, live chiefly on it. It is soothing to the bowels, and particularly suitable in cases of diarrhœa.

Corn (maize), so much used in this country and in Southern Europe, is fairly nitrogenous, and is comparatively rich in fat. It affords good and serviceable food, whether eaten from the ear (sugar corn, boiling ears) or made into bread, mush or gruel. It is not, however, quite so easily digested as wheat, oatmeal, or rice.

Vegetables.

Peas and Beans are highly nitrogenous, besides containing a great deal of starch. But that their share of salts, especially phosphates, is less, and that they are more uncertain of digestion, they would rank along with wheat bread in value.

What we call the **Irish potato** is really of American origin. Abounding in starch, potatoes contain but little nitrogen. Their great merit is, that they produce largely for their cost; they can be made palatable by cooking, and go a great ways in bulk as food.

The Sweet Potato is an Old World plant, known long before the discovery of America. It is harder to keep than the round or white potato, easily undergoing a sort of sugary decay. At the best, it is not quite so easily digested as the round potato. The *yam* of the East and West Indies, is a root somewhat analagous to the sweet potato, and another similar root is a good deal eaten in the Sandwich Islands.

The Tomato is really a *fruit*. It is more nearly always wholesome for everybody than any other of what we call vegetables. Turnips, carrots, parsnips, the onion, cabbage, squash, and salsify, all rank below potatoes and tomatoes in digestibility.

Cauliflowers and **Cabbages**, are plants of the same species, differently developed. But the cauliflower is, under cultivation, much the most tender and digestible.

Beets, when young, are very easily digested; quite otherwise after they grow old and tough. Asparagus, of the best quality, is entirely wholesome. Spinach, in good condition, is not at all indigestible.

Mushrooms are strong and meat-like food, wholesome for most, but not for all people. The point of importance is, to be sure *they are* mushrooms. A number of other *fungi* are safe and nourishing, but some are very poisonous. Never gather or eat what are called mushrooms unless they have, underneath, pink gills, so called, and above, as well as on the stem, a skin which can be easily peeled off; also, they have no unpleasant taste or smell, and grow not in dark woods, but in rather open fields.

Celery, when white and tender, is, in moderation, very wholesome, either raw or stewed. It represents, when eaten raw, a class of food articles (the radish and lettuce are others) of more importance than is generally appreciated. We need, every few days, to take something in its natural state, which has "never seen the fire."

Fruits.

As a rule, *fresh fruits are wholesome.* They promote the natural action of the bowels, and are refreshing and antiscorbutic. When the bowels are disordered, as in diarrhœa or dysentery (except when these result from *scurvy*), they are not suitable.

All fruits are not equally digestible or desirable for persons of uncertain health. *Peaches*, *apples*, and *oranges* come the nearest to being good for everybody while in health; and oranges, as well as the finer and more delicate kinds of *grapes*, are often with advantage allowed to the sick. Many grapes have a tough pulp, which ought not to be swallowed; and the seeds never should be. They, and apple cores, and even cherry-stones, are often taken into the stomach, with no harm following. But they are not digestible, and now and then they collect together and cause obstruction. There is a queer little offset to the large intestine into which, in a few instances, an apple-seed or some such thing has found its way, producing an inflammation ending in death.

The *least* wholesome of our domestic kinds may be said to be the *cherry*, and, doubtful for all dyspeptics, also, *pears*, of foreign fruits, *figs* and *pineapples*. *Prunes* (partly dried plums), *figs*, and *dates* are especially laxative to the bowels.

Stewed fruits are far less uniformly digestible than the same eaten fresh, in season. *Preserves* ought to be ruled out of the diet of dyspeptics, and taken, as a rare indulgence, in small quantities only, by all. *Lemonade*, made with the juice of lemons (not citric acid of the drug-shop), is not only refreshing but beneficial to most persons in hot weather, and when sick with fever. But, in the last case, irritability of the stomach or bowels may sometimes prevent its use.

Canned fruits, put up with skill and care, may approach very nearly to fresh fruits in wholesomeness; but the skill and care actually used are often far from perfect. Moreover, of the different materials employed for keeping fruit or other food for a long time, the safest and best, undoubtedly, is *glass*.

Eggs.

There is excellent nourishment, mostly albuminoid, but with a small amount of fat (in the yolk) in eggs. There is, of course, no truth in the popular saying, that "an egg is as good as a pound of meat." *In proportion* to its *weight*, an egg is equally nourishing with meat; that is all. It is of great consequence that eggs shall be *fresh* when eaten.

Meats.

All parts of the Animal Kingdom furnish food for men in some quarters of the earth. *Vertebrates* are represented abundantly; in *mammals* (as the ox and sheep), *birds*, *reptiles*, (*e. g*. the terrapin), and *fishes*. *Molluscs*, as oysters and clams, are favorites with many. *Articulates* are familiar in the lobster, crab, prawn, and shrimp.

Beef is the strongest kind of meat, the most concentrated albuminoid food. It is, also, when tender, as digestible as any other article of diet. Many dyspeptics eat only beef and bread every day. A larger range, however, would nearly always be better for them. Signs of good quality in beef are these: it should be of a fresh red color,

neither pale-pink nor dark-purple; marble-veined lightly with fat; not wet, but firm to the touch; with little odor, none unpleasant; should shrink but little in cooking. If tested with litmus paper, its juice will show acidity by reddening it.

Veal is not nearly so easily digested as beef. Some persons, not usually dyspeptic, have to avoid it altogether. A bad fraud in some city markets is the sale of *too young* veal ("bob" veal). It ought never to be eaten before it is four or five weeks old.

Mutton is very nearly (some analysts say quite) as strong a nitrogenous food as beef, and scarcely less digestible with some persons. Either kind of meat may be tough or tender, and so may give the stomach, as well as the teeth, more labor in disposing of it. Tough meat *does not pay;* don't buy it. Internal work in digestion has to be economized or supported like external work, or the strength goes down.

Lamb is more desirable every way than old mutton. It seldom, or never, comes to our markets too young.

Pork should always be avoided by dyspeptics and by persons of uncertain peptic powers. *All* rules about diet are intened for these. Healthy people can digest almost anything, except bob veal and very ancient knife-resisting mutton, or leathery skirt of beef; anything, in short, that their teeth will chew. Fresh pork, for the hearty, active man or woman, or roast pig, is good and nourishing; but it must always be *well done.* All hog-meat must be cooked *through* (not only on the surface) to destroy any possible *parasites* which it may contain. Of these, *trichinæ* are the worst, being dangerous to life; but they are certain to be killed, and thus made harmless, by thoroughly cooking the meat. Smoking it without cooking will not make it safe. Freezing it may do so.

Birds have weaker, less nitrogenous meat than mammals, but generally more tender and delicate. Most digestible of domestic birds are the turkey, chicken, and guinea-fowl; less so the duck (though often very good), and least fit for doubtful stomachs, the goose. Pigeons are moderately digestible, but one soon tires of them. Our wild partridges, prairie chickens, and grouse (some of which are called pheasants, but there are no true pheasants native to this country), and quails, are very good game-birds for the table. So are reed-birds (favorites for invalids and convalescents); woodcock, snipe, and canvas-back ducks. The turkey is perhaps our most valuable original contribution to the diet of mankind, unless we except the potato and maize.

Fish, of some kinds, are consumed in almost all parts of the world. Thousands of people depend upon fishing for a living. There is still less nitrogenous material in fish than in birds' meat; some, as the salmon, have a good deal of fat. A larger proportion of the phosphates (salts containing phosphorus) is present in their substance than in land animals. Some persons imagine that fish are therefore especially a brain-making diet. But there is enough of the phosphate in ordinary meat and bread for any one's brains, if he can appropriate and assimilate them well. Fresh fish, nicely cooked, are wholesome and nourishing.

Of articulates, lobsters, crabs, prawns, and shrimps have been already mentioned. Lobsters, at least, when *fresh*, are not unwholesome for most people. Remember, everything taken out of the water spoils soon after it dies. The place to enjoy lobsters, crabs, and shrimps safely is at the seashore.

Molluscs, as *oysters* and *clams*, are nowhere more appreciated than in America. Our oysters are probably the *best* in the world; although in tropical waters they grow a great deal larger. Clams are tougher, and much less digestible; their soup can be enjoyed, however, without risking the hard clam itself.

Convalescents can begin with good sound oysters before they dare venture upon more solid food. One of their virtues is that they can be cooked in so many ways. Raw, they are digestible by the hungry man almost always. Roasted in the shell, they are manageable by every stomach that has any gastric juice in it; no solid is more digestible. Panned, steamed, stewed, broiled they are digestible and wholesome. *Fried* oysters must be, with the dyspeptic, quite forbidden.

Time Table for the Housekeeper.

	Mode of Preparation	Time of Cooking H. M.	Time of Digestion H. M.
Apples, sour, hard	Raw	. . .	2 50
Apples, sweet and mellow	Raw	. . .	1 50
Asparagus	Boiled	15 to 30	2 30
Beans (pod)	Boiled	1 00	2 30
Beans with green Corn	Boiled	45	3 45
Beef	Roasted	* 25	3 00
Beefsteak	Broiled	15	3 00
Beefsteak	Fried	15	4 00
Beets, young	Boiled	2 00	3 45
Beets, old	Boiled	4 30	4 00
Bread, Corn	Baked	45	3 15
Bread, Wheat	Baked	1 00	3 30
Butter	Melted	. . .	3 30
Cabbage	Boiled	1 00	4 30
Cauliflower	Boiled	1-2 00	2 30
Cake, Sponge	Baked	45	2 30
Carrot, Orange	Boiled	1 00	3 15
Cheese, old	Raw	. . .	3 30
Chicken	Fricasseed	1 00	3 45
Codfish, dry and whole	Boiled	* 15	2 00
Custard (one quart)	Baked	30	2 45
Duck, tame	Roasted	1 30	4 00
Duck, wild	Roasted	1 00	4 50
Dumpling, Apple	Boiled	1 00	3 00
Eggs, hard	Boiled	10	3 30
Eggs, soft	Boiled	3	3 00
Eggs	Fried	5	3 30
Fowls, domestic, roasted or	Boiled	1 00	4 00
Lamb	Boiled	* 20	2 30
Meat and vegetables	Hashed	30	2 30
Milk	Boiled	. . .	2 00
Mutton	Roast	* 25	3 15
Mutton	Broiled	20	3 00
Onions	Boiled	1-2 00	3 00
Oysters	Stewed	5	3 30
Parsnips	Boiled	1 00	3 00
Pigs' Feet	Soused	. . .	1 00
Pork	Roast	* 30	5 15
Pork	Boiled	* 25	4 30
Pork, raw or	Fried	. . .	4 15
Pork	Broiled	20	3 15
Potatoes	Boiled	30	3 30
Potatoes	Baked	45	3 30
Potatoes	Roasted	45	2 30
Rice	Boiled	20	1 00
Sausage	Fried	25	4 00
Soup, Vegetable	Boiled	1 00	4 00
Soup, Chicken	Boiled	2 00	3 00
Soup, Oyster or mutton	Boiled	† 3 30	3 30
Spinach	Boiled	1-2 00	2 30
Tapioca	Boiled	1 30	2 00
Tomatoes	Fresh	1 00	2 30
Tomatoes	Canned	30	2 30
Trout, Salmon, fresh, boiled or	Fried	30	1 30
Turkey, boiled or	Roasted	* 20	2 30
Turnips	Boiled	45	3 30
Veal	Broiled	20	4 00

* Minutes to the pound. † Mutton Soup.

The time given is the general average; the time will vary slightly with the quality of the article.